THE AMPHIPOD FAMILY PLEUSTIDAE ON THE PACIFIC COAST OF NORTH AMERICA: PART III. SUBFAMILIES PARAPLEUSTINAE, DACTYLOPLEUSTINAE, AND PLEUSIRINAE. SYSTEMATICS AND DISTRIBUTIONAL ECOLOGY.

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ABSTRACT

The gammaridean amphipod subfamily Parapleustinae Bousfield & Hendrycks, 1994, contains 28 described species of which 26 have been recorded from coastal marine regions of the North Pacific Ocean. From shallow coastal shelf waters of the both continental coasts are here described and figured the following taxa: *Parapleustes americanus*, new species; *P. ishimarui*, new species; *Chromopleustes lineatus*, new genus, new species; *Gnathopleustes serratus* new genus, new species, *G. simplex*, new species; *G. trichodus*, new species; *G. pachychaetus*, new species; *Trachypleustes vancouverensis*, new genus, new species; *T. trevori*, new species; *Micropleustes nautiloides*, new genus, new species and *M. behningiodes*, new species. Also proposed for inclusion within the subfamily are *Commensipleustes*, new genus (type species: *C. commensalis* (Shoemaker, 1952); *Incisocalliope* J. L. Barnard, 1959 (revived status) (type species: *I. newportensis* Barnard, 1959). This genus contains eight species of which *Incisocalliope nipponensis* is newly described from the Sea of Japan. Also variously redescribed, or treated, are: *Gnathopleustes den* (J. L. Barnard, 1969b); *G. pugettensis* (Dana, 1853); *Incisocalliope newportensis* J. L. Barnard, 1959; *I. bairdi* (Boeck, 1871); *Chromopleustes oculatus* (Holmes, 1908); *C. johanseni* (Gurjanova, 1951); *Micropleustes nautilus* (J. L. Barnard, 1969b) and *M. behningi* (Gurjanova, 1938). *Dactylopleustes echinoides*, new species (subfamily Dactylopleustinae Bousfield & Hendrycks, 1994) is newly described and figured, and *Pleusirus secorrus* J. L. Barnard, 1969b (subfamily Pleusirinae Bousfield & Hendrycks, 1994) is redescribed and figured.

Taxonomically, the seven parapleustin genera were found to be morphologically distinctive, and not very closely similar. A modified phenetic cluster analysis indicated that the most southerly, temperate and subtropical genus *Incisocalliope* is phyletically most advanced, and that the mainly N. American cold temperate genus *Chromopleustes* is the most primitive, despite the relatively advanced nature of its mouthparts, and weakly sexually dimorphic gnathopods.

Biogeographically, of the 26 species of Parapleustinae recorded from the North Pacific region, 16 species (in seven genera) occur along the North American coast, nine species (in four genera) along Asiatic shores, and one species in the Hawaiian Islands, south central North Pacific. The genera *Parapleustes, Chromopleustes, Micropleustes, Dactylopleustes* and *Pleusirus* are Pan-Pacific, with approximately equal numbers of species on North American and Asiatic coasts. However, the genera *Trachypleustes, Gnathopleustes* and *Commensipleustes,* containing about a dozen species in total, are apparently endemic to the North American Pacific region. The isolated occurrence of *Parapleustes gracilis* (Buchholz, 1874), and *Incisocalliope aestuarius* (Watling & Maurer, 1973) in different temperature regimes of the North Atlantic region, appear anomalous. Although explanations proposed for such disjunct distributions are not entirely satisfactory, they underscore the high regional endemicity of subfamily Parpleustinae within the North Pacific Basin.

INTRODUCTION

Pleustid amphipods form an important assemblage of microcarnivorous amphipod crustaceans in the North Pacific marine region. Of the 12 recognized subfamilies (Bousfield & Hendrycks, 1994), the Parapleustinae, with nearly 30 described species, is one of the largest and numerically dominant groups in shallow-water habitats of both Asiatic and North America coasts. The monotypic subfamily Pleusirinae is common along the North American coast. Species of Dactylopleustinae are commensals on echinoid echinoderms, rarely encountered, and the subfamily probably more diverse than the three known species would indicate.

Prior to the present investigation, only eight species of subfamily Parapleustinae had been recorded from North Amer-ican Pacific localites, all of which had been relegated to the genus *Parapleustes* by Barnard & Karman (1991). Early 19th century records of Dana, Stimpson, Boeck and others had been capably summarized by Stebbing (1906). In the first half of this century, Holmes (1908) described *Pleustes oculatus* from off California. Few other records accrued until J. L. Barnard commenced his monumental series of studies (1952, 1954, 1956 *et sequ.*) on amphipod communities of the California coast. His paper with Given (1960) summarized information on five parapleustins known to that date, including *Parapleustes newportensis* Barnard, 1959, that had been described initially as the type species of a new genus, *Incisocalliope*. Shoemaker (1952) had earlier described *P. commensalis* from the pleopods of a spiny lobster off southern California, and later (1964, posthumously) added to records of Dana's "*Parapleustes pugettensis*" from Dillon Beach, California. Dana's species name was here found to embody several distinct taxa, mostly new to science. Barnard (1969b) described *Parapleustes den, P. nautilus* and *Pleusirus secorrus* from the Central California coast,

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and the following year (1970) added *P. derzhavini makiki* from the Hawaiian Islands. Very recently, Barnard & Karaman (1991) submerged *P. johanseni* Gurjanova, within *P. oculatus* Holmes, and synonymized *P. bairdi* (Boeck) and *P. newportensis* (Barnard) with *P. pugettensis* (Dana). The pragmatic illustrated keys of Barnard (1975), Staude (1987), and the regional annotated listing of Austin (1985), provide useful summaries of existing knowledge and bases on which to conduct further studies.

On the Asiatic Pacific coast, work on parapleustins commenced with Gurjanova's description of *Neopleustes derzhavini* and *Pleustes behningi* (1938) and *Parapleustes johanseni* (1951). Kudryaschov (1972) provided records of *P. nautilus* (later proven to be a new species). Tzvetkova (1975) described the echinoid commensal species *Parapleustes echinoicus*, later given separate generic status (as *Dactylopleustes*) by Karaman & Barnard (1979). Kudryaschov & Tzvetkova (1975) concluded the Russian contribution with a description of *Pleusirus secorrus asiaticus.*

Workers from Japan entered the western Pacific parapleustin scene with Irie & Nagata's preliminary regional listing (1962) of "Parapleustes oculatus" and "P. pugettensis". Ishimaru (1984) contributed most significantly with *Parapleustes dilatatus* n. sp., *P. longimanus*, n. sp., and records of *Parapleustes gracilis* Buchholz, *P. behningi* Gurjanova, and *P. derzhavini* Gurjanova. Soon after, Ishimaru (1985) added *Pleusirus secorrus* to the regional list. Hirayama (1988) described *Parapleustes filialis*, n. sp. and *Dactylopleustes obsolescens*, n. sp. Finally, Ishimaru (1994) treated the entire pleustid fauna of Japan in his useful regional catalogue of gammaridean and ingolfiellidean species.

The previous studies had revealed a significant new fauna of parapleustinids, pleusirins and dactylopleustins in the western Pacific and Californian regions. However, corresponding faunas of the enormous intervening costal areas were virtually unknown. Based on extensive new material from the coasts of British Columbia, southeastern Alaska, and Washington and Oregon states, the present study attempts to fill this large hiatus in systematic knowledge. It also attempts to relate these faunas phyletically and biogeographically to faunas of adjacent regions and elsewhere.

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SYSTEMATICS

Family PLEUSTIDAE

PARAPLEUSTINAE, Bousfield & Hendrycks, emended

Parapleustinae Bousfield & Hendrycks, 1994: 41.

Type genus. *Parapleustes* Buchholz, 1874 (p. 67).

Genera. *Chromopleustes,* new genus (p. 73); *Commensipleustes*, new genus (p. 82); *Gnathopleustes,* new genus (p. 82); *Incisocalliope* J. L. Barnard (p. 95); *Trachypleustes*, new genus (p. 105); *Micropleustes*, new genus (p. 111); .

Removals. *Parapleustes assimilis* (Sars,1883); *P. bicuspis* (Kroyer, 1838); *P. monocuspis* Sars, 1895; *P. gagarae* Gurjanova, 1972; *P. major* Bulycheva, 1952, *P. bicuspoides* Nagata,1965; *P. sinuipalma* Dunbar, 1947, *P. triangulocuIatus* Bulycheva, 1952; *P. tricuspis* Ishimaru, 1984, to genera within subfamily Neopleustinae (Bousfield & Hendrycks, 1994, and in prep.).

Diagnosis. Body generally small to medium, smooth above, not mucronate on pleon; external surface pattern often colourful or disruptive. Head, rostrum short, little or not exceeding rounded lateral head lobe. Eyes variable in size and form, usually medium large, subrotund. Antennae usually elongate; antenna 1 the longer, occasionally short, peduncular segments often shortened. Accessory flagellum minute.

Mouthparts generally strongly modified. Upper lip distinctly notched, lobes variously asymmetrical. Lower lip broad, squat, outer lobes oblique. Mandible, molar small, weak, thumblike, apex pilose, triturating surface lacking or

vestigial; blades generally numerous, often strongly modified: chisel-shaped, cusplike, or molarized in form; left lacinia wide, multidentate, cutting edge straight; right lacinia lacking; incisor multidentate, third (distal) tooth largest; palp segment 3 not shorter than 2, with basal "A" seta (of Cole, 1980). Maxilla 1, inner plate with single apical seta; outer plate with 9 (rarely 15-18) apical spine teeth; palp occasionally broadened, with distal facial setae, apices spinose; segment 1 often with lateral ("shoulder") seta(e). Maxilla 2 ordinary, inner palate with stout inner marginal plumose seta(e). Maxilliped: palp strong, segment 2 usually longest, 3 lacking distinct distal process; outer plate narrow (vertical margins subparallel), sparsely setose and/or spinose; inner plate short, apex with "button" spines, inner margin with few setae and/or spines.

Coxal plates large, deep, broad; coxa 1 generally broadening distally and rounded below; hind corners cuspate. Gnathopods various: weak to medium strongly developed; gnathopod 2 slightly larger, differing slightly in form, and occasionally sexually dimorphic. Gnathopod 1, basis, margins variously setose; meral cusp weak; propod, palm usually oblique, convex, with median tooth.

Peraeopods 3 & 4 ordinary, normally spinose, dactyls short to medium. Peraeopods 5-7 homopodous; coxae medium deep, hind margins rounded, laterally smooth; segment 4 longer than 5 which it variously overhangs behind.

Pleon plates 2-3, hind corners acuminate, not produced. Pleopods medium strong, ordinary. Uropods 1 & 2 ordinary; peduncle of uropod 1 with prominent distolateral spine; rami elongate, outer shorter, margins and apex strongly spin-ose. Uropod 3, inner ramus markedly the longer, margins spinose.

Telson elongate, narrowing distally, keeled proximally; apex rounded; penicillate setae medio-distal.

Coxal gills variable, smaller and saclike anteriorly, larger, platelike posteriorly. Brood plates large, broad.

Distributional ecology. The subfamily is essentially endemic to eulittoral shelf habitats of the North Pacific region. However, three species occur in isolation elsewhere, viz., the northeastern North Atlantic, the western North Atlantic, and the Hawaiian Islands of the central North Pacific (see p. 131).

Taxonomic commentary. The Parapleustinae is closely allied to subfamily Neopleustinae (Bousfield & Hendrycks, 1994). The latter differs, however, in having a well-developed keeled rostrum, dorsal body processes, a short, nearly centrally keeled telson, large mandibular palp, and a distally oblique and processiferous maxillipedal palp segment 3. Also, component members of the Neopleustinae occur in deep cold waters of the Arctic, North Atlantic and North Pacific regions; none is intertidal.

Numerical taxonomic analysis of the Parapleustinae reveals a complex of 7 generic-level subgroups (Fig. 43, p. 127), the species of which are treated systematically below.

Parapleustes Buchholz

Parapleustes Buchholz, 1874: 337.—Stebbing 1906: 320.—Gurjanova, 1951: 648 (partim).—Barnard 1969a: 425 (partim).—Barnard & Karaman, 1991: 649 (part).

Type species. *Parapleustes gracilis* Buchholz, 1874.

Species composition (North Pacific). *Parapleustes ishimarui* (= *P. gracilis* Ishimaru, 1984) (p. 70); and *P. americanus*, new species (p. 71).

Diagnosis. Body small, smooth above. Head, rostrum very short; anterior head lobe subacute; inferior antennal sinus broadly incised. Eye medium, elliptical to roundish. Antennae slender, medium long, weakly setose. Antenna 1 typically the longer; peduncle 3 short; peduncle 1, distal process weak; accessory flagellum minute.

Mouthparts modified. Upper lip shallowly notched, lobes asymmetrical. Lower lip medium wide, squat; outer lobes thick, rounded, oblique. Mandible: molar reduced to a blunt setulose knob; incisor irregularly toothed, distal teeth smaller; left lacinia 8-10 dentate; blades 5-12 in row, stout, weakly molarized; palp slender, segment 3 with few (3-5), posterior marginal "D" spines; maxilla 1, outer plate with 9 mainly tall apical spines; palp not broadened, with ~4 apical spines and several oblique subapical (facial) setae. Maxilla 2, inner plate little broadened, with marginal plumose seta. Maxilliped, palp strong, dactyl strong, segment 3 lacking distal process; segment 2 largest; outer plate short, little or not longer than inner, 1(2) apical spines; inner plate with few apical button spines and few marginal setae.

Coxal plates wide, deeper than respective body plates; lower margins straight, hind notch(es) distinct; coxa 1 little smaller than 2, slightly expanded distally.

Gnathopods medium large, closely subequal, little or not sexually dimorphic; propods broadening distally, palms smoothly convex, usually with central median tooth, postero-distal angle with 1-2 clusters of spines not extending onto palm; hind margin smooth, about equal in length to palm; carpus usually short, hind lobe deep; postero-distal process of merus acutely produced; bases slender, antero-marginal setae distally restricted.

Peraeopods 3-7 slender, weakly spinose; segment 5 and dactyls slender, relatively long. Peraeopods 3-4, margins of segments 4-6 weakly spinose, lacking special setae. Peraeopods 5-7 regularly homopodous, bases broad, convex behind.

Pleon plates broad, deep, smooth behind, hind corners weakly acuminate. Pleopods strong, not sexually dimorphic. Urosome short; urosome 2 not occluded dorsally. Uropods 1 & 2 rami slender, tips spinose, usually extending beyond uropod 3. Uropod 1, peduncle with distinct latero-distal spine; rami subequal in length. Uropod 2, inner ramus the longer. Uropod 3, inner ramus markedly the longer.

KEY TO KNOWN GENERA OF SUBFAMILY PARAPLEUSTINAE

1. Gnathopods 1 & 2, palm of propod with median tooth present, variously developed; gnathopod propod, length of palm about equal to (or longer than) posterior margin; gnathopod propods, hind margin lacking setae (except some *Incisocalliope*); gnathopod 2, carpus always relatively short, anterior margin <1/2 length of propod ..... 3.
—Gnathopods 1 & 2, propodal palm, median tooth lacking or very reduced; gnathopod propod, length of palm short, usually much less than posterior margin (except in some *Micropleustes*); propod, hind margin with 1 - 4 setae or setal groups; gnathopod 2, carpus usually elongate, anterior margin about equal in length to propod (except some *Micropleustes*) ..... 2.

2. Antennae slender, flagella elongate, antenna 1 usually markedly the longer; peraeopods 5-7, segment 4 postero-distally overhanging segment 5 by less than 1/4 length of segment 5; coxal plates 2 - 4 not exceptionally large and/or deep, distal portions of respective bases exposed below, hind cusps of coxae 2 & 3 single ..... *Chromopleustes* (p. 73)
—Antennae short, stout, subequal, flagella little (or not) longer than respective peduncles; peraeopods 5 - 7, segment 4 overhanging segment 5 postero-distally by nearly half length of segment 5; coxae 2 - 4 large and deep, totally masking respective bases, hind corners with 2-5 small cusps (rarely single) .....
..... *Micropleustes* (p. 111)

3. Antennae short, flagellum: of A1 little longer than peduncle, of A2 shorter than peduncle; gnathopods 1 & 2, carpus very short, length less than 1/4 that of propod, hind lobe small, narrow; pleon plate 3, hind corner with small hook ..... *Parapleustes* (p. 67)
—Antennae normally elongate, flagellum distinctly longer than respective peduncle; gnathopds, dorsal margin of carpus more than one-fourth length of propod, hind lobe about half as wide as its dorsal margin; pleon plate 3, hind corner acuminate, not mucronate ..... 4.

4. Peraeopods 5-7, segment 6 broadened distally, anterior margin with stout spines, forming (with dactyl) a grasping organ; maxilliped, outer plate shorter than inner plate; coxa 1 not noticeably broadening distally, hind margin lacking proximal short spine(s) ..... *Commensipleustes* (p. 82)
—Peraeopods 5-7, segment 6 normally slender and spinose; maxilliped, outer plate slightly longer than inner plate; coxa 1 broadening distally, hind margin with proximal spine(s) ..... 5.

5. Gnathopods large, strongly subchelate, variously sexually dimorphic; basis, anterior marginal setae confined to distal angle; antenna 2, peduncular segments not shortened, surfaces armed variously with clusters of short setae ..... *Gnathopleustes* (p. 82)
—Gnathopods medium subchelate, propod and carpus combined shorter than depth of coxa, not sexually dimorphic; basis, anterior margin often setose throughout; antenna 2, peduncular segments 4 & 5 shortened and/or bare of surface setal groups ..... 6.

6. Antenna 1, peduncular segment 2 short, less than half length of segment 1; mandible, palp segment 2 weakly setose (6-7 setae); left lacinia 10-12 dentate; maxilliped, palp segment 3 lined medio-distally with short spines ..... *Incisocalliope* (p. 95)
—Antenna 1, peduncular segment 2 not shortened, length greater than half that of segment 1; mandible, palp segment 2 with numerous (10-15) medial setae; left lacinia 7-9 dentate; maxilliped, palp segment 3 lacking distal short spines ..... *Trachypleustes* (p. 105)

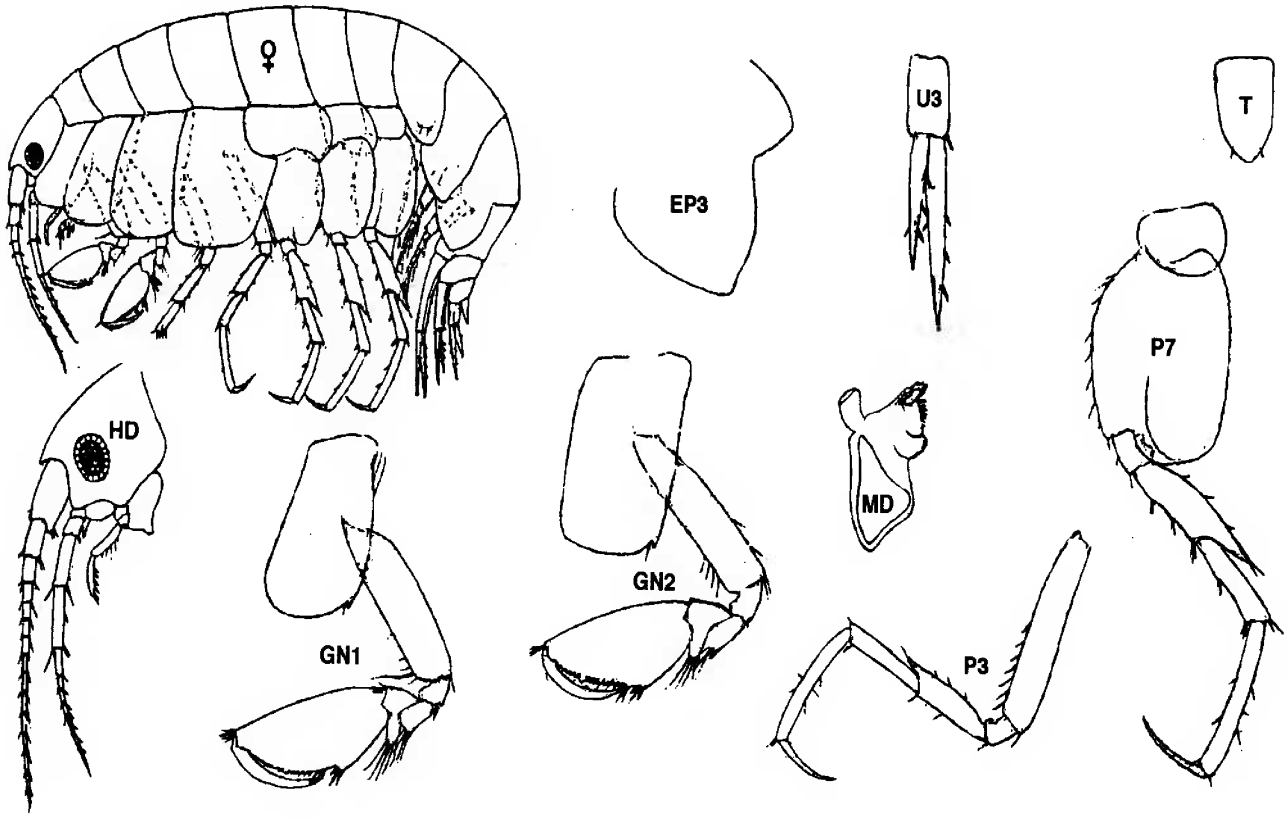

FIG. 1. *Parapleustes gracilis* Buchholz. Female (2.5 mm). Norwegian Sea. (after Sars, 1895).

Telson medium long, narrowing, subacute; dorsal penicillate setae slightly distad (of middle). Coxal gills sac-like, medium, unequal, smallest anteriorly.

Taxonomic commentary. The following species are removed from *Parapleustes, sens. str.*: *P. assimilis Sars* and *P. tricarinatus* Ishimaru (to *Neopleustes*); *and P. commensalis* Shoemaker (to *Commensipleustes*), for the following combination of reasons: lack of a disto-lateral spine on the peduncle of uropod 1; the peraeopods are too long, or stout, dactyls too short; gnathopod propods are too slender, and/or the posterior margin is too strongly setose; the palmar tooth is lacking; the carpus is too long, shallow; the mouthparts are significantly different, especially in the mandibular blades; and the pleon is dorsally carinate.

Within *Parapleustes* proper, the markedly smooth propods and narrow carpal lobes of the gnathopods might suggest a closer relationship with the genera *Pleustes* and *Pleusymtes*.

Distributional commentary. The genus *Parapleustes* (sens. str.) is essentially arctic-subarctic in present distribution, dipping southward variably, and mainly subtidally in the North Pacific and northern North Atlantic regions. *Parapleustes gracilis* is not typical of the subfamily but became the type species because it is the only member occurring in the North Atlantic region where amphipod taxonomy began.

Parapleustes gracilis Buchholz

(Fig. 1)

Parapleustes gracilis Buchholz, 1874: 337, fig. 1.—Stebbing, 1906: 320.—Gurjanova, 1951: 648, fig. 444.—Barnard & Karaman, 1991: 650.

non *Parapleustes gracilis* Ishimaru, 1984.—Hirayama, 1988?

Paramphithoe brevicornis G. O. Sars, 1895: 353, pl 124. 2.

Diagnosis. Female (2.5 mm): Head, eye medium roundish, black. Antenna 1, peduncular segment 2 short, length ~1/2 segment 1; flagellum 13-segmented. Antenna 2, peduncular segments 4 & 5 slender, subequal; flagellum 8-segmented.

Mouthparts not described (not in Sars 1895, nor Stebbing, 1906) but probably similar to those of *P. americanus* (p.71).

Coxae 1-3 deep, medium broad, lower margins weakly convex, hind corners each with single cusp. Gnathopod 1, basis with weak antero-distal setal cluster; merus with acute postero-distal process; carpus short, hind lobe narrow, deep; propod distinctly expanding distally, inner face smooth; palmar margin oblique, convex, postero-distal angle with spine groups on either side of distinct dactyl-tip depression. Gnathopod 2 closely similar in size and form; basis, antero-distal margin with several setae.

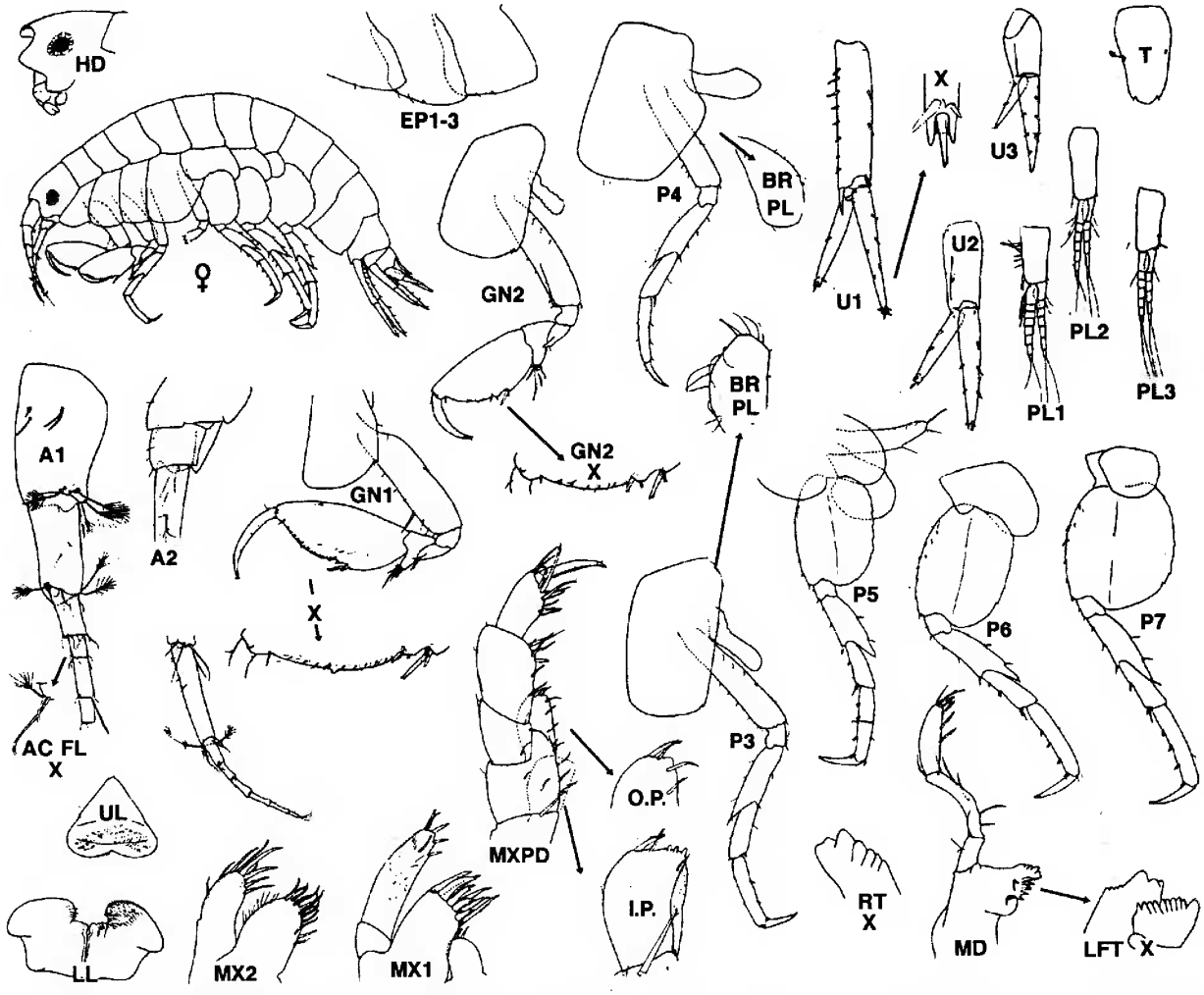

FIG. 2. *Parapleustes ishimarui,* new species. Female ov (2.4 mm) (= *P. gracilis* Ishimaru, 1984). Japan.

Peraeopods 3 & 4, bases with several antero-distal setae; segments 4-6 slender, elongate (especially segment 6); segments 4 & 5 subequal in length; marginal setae sparse; dactyl curved, elongate, length > 1/2 segment 6. Peraeopods 5-7 slender, bases medium broad, postero-distal lobes shallow; segments 4 & 5 subequal; segment 6 elongate; dactyl elongate, length > 1/2 segment 6.

Pleon plate 3, hind corner weakly acuminate, not hooked. Urosome 2 with free dorsal margin. Uropods 1-2 slender, peduncle and rami weakly spinose. Uropod 3, outer ramus 2/3 length of slender inner ramus . Telson medium, length ~1.5X basal width, apex subacute.

Distributional commentary. This species is endemic to arctic and arctic-boreal, North Atlantic waters. It has not been recorded authentically from the North Pacific region. As the type species of the genus, this North Atlantic form is included here for comparative purposes with North Pacific material previously ascribed to the name *Parapleustes gracilis* (above).

Taxonomic commentary. *Parapleustes gracilis* is the type of a small group of species here restricted to a few members of the North Atlantic and North Pacific pleustid fauna. Of the 21 species of *Parapleustes* listed by Barnard & Karaman, most are members of subfamily Parapleustinae, but only *P. gracilis* (= *P. brevicornis* Buchholz?) is retained in the genus *Parapleustes*. All others are removed to other genera, and in some cases, other subfamilies. It has been found advisable to restore to the original position a number of transfers, and a number of synonymies, by others. Thus, *Micropleustes nautilus* is removed from the synonomy of *M. behningi*, and restored to full species recognition, and the genus *Incisocalliope* J. L. Barnard, 1959, is removed from the synonomy of *Parapleustes* Buchholz and restored to its original full generic position.

Parapleustes ishimarui, new species
(Fig. 2)

Parapleustes gracilis Ishimaru, 1984: 432, figs. 21-24.—Ishimaru, 1994: 54.

Diagnosis. Female (2.4 mm): Head, eyes small, round, black. Antennae short. Antenna 1, peduncular segment 2 medium, length > 2/3 peduncular segment; accessory flagellum, apex rounded, with 1 plumose and 2 simple setae; flagellum 9-10 segmented. Antenna 2, peduncular segment

KEY TO KNOWN SPECIES OF *PARAPLEUSTES* (SENS. STR.)

1. A1, peduncle 2 short; peraeopod 7, basis, posterior margin nearly straight; uropods 1 & 2, rami shorter than peduncle; peraeopods 3 & 4, dactyls long (>1/2 propod) . . . . . *P. gracilis* (Buchholz)(p. 69)
—Antenna 1, peduncle 2 normal; peraeopod 7, basis, posterior margin strongly convex; uropods 1 & 2, inner ramus about equal in length to peduncle; peraeopods 1 & 2, dactyls shorter (<1/2 propod) . . . . 2.

2. Peraeopod 7, basis finely crenulate; pleon plate 3, hind corner forming small hook or mucrona; eye large, ovate; maxilliped, outer plate short . . . . . *P. americanus,* n. sp. (p. 73)
—Peraeopod 7, basis with few (8) large posterior notches along posterior margin; pleon plate 3, hind corner blunt-acuminate; eye small, round; maxilliped, outer plate normal, equal in length to inner plate . . . . . *P. ishimarui,* n. sp (p. 71)

5 slender, slightly shorter than segment 4; flagellum short, 6-segmented.

Upper lip conical, apex shallowly incised, lobes slightly asymmetrical. Lower lip, inner lobes deep, not broad; outer lobes shallowly oblique. Mandible, molar prominent. slightly upturned apically; spine row with 6-7 short blades; cutting edge (left) with 3-4 large teeth proximally and 4 small denticles distally; palp segment 3, basal "A" setae short; postero-distal margin with 4 pectinate "D" spines; left lacinia 10-dentate. Maxilla 1, inner plate with single short seta; palp, apex sharply rounded, with 4 slender spines. Maxilla 2, inner plate broad, length nearly equal to outer plate, inner margin with short proximal seta. Maxilliped, inner plate broad, with 3 apical marginal "button" spines; outer plate medium, taller than inner plate, apex blunt, with 2 unequal slender spines; palp segment 3 slender, dactyl slender almost straight.

Coxae 1-3 lower margins gently convex, hind corners with single cusp. Coxa 4 hind marginal process rounded. Gnathopod 1, basis with weak antero-distal setae; merus with cusp; carpus short, hind lobe narrow, deep; propod expanding distally with weak inferior facial setae, palmar margin longer than convex posterior margin, postero-distal angle with weak distal and strong proximal spine groups adjacent to dactyl-tip depression. Gnathopod 2 closely similar in form but propod slightly smaller, and basis lacking antero-distal setal group.

Peraeopods 3 & 4 regular, slender, segment 5 relatively short (<segment 4), margins weakly spinose; dactyl short (~ 1/3 segment 6). Peraeopods 5-7 subsimilar, increasing slightly in size posteriorly; segment 4 and dactyl relatively short. Peraeopod 7, basis more broadly expanded, hind margin weakly crenulate.

Pleon plate 3, hind corner subquadrate. Uropods 1 & 2 relatively short, margins weakly spinose, outer ramus distinctly the shorter. Uropod 3, outer ramus short, length ~60% stout inner ramus. Telson subrectangular, narrowing slightly distally, apex broadly rounded.

Type material. Ishimaru (1984): Female "a" (3.4 mm) **Holotype**; intertidal, Ohzuchi, Japan. Zoological Museum collections, Faculty of Science, Hokkaido University.

Distribution. Known from a single intertidal station, at Ohzuchi, Iwata Prefecture, northeastern Japan.

Etymology. The species is named in named in honour of Dr Shin-ishi Ishimaru who has contributed very significantly to knowledge of the marine amphipod fauna of Japan and adja-cent regions.

Taxonomic commentary. *Parapleustes ishimarui* appears most closely related to *P. americanus* but differs in characters provided in the key (above).

Parapleustes americanus, new species
(Fig. 3)

Parapleustes pacifica (?) Austin, 1985: 592.—Barnard & Karaman, 1991: 650 (part).

Material examined:

ALASKA.

Bering Sea: N. E. of St. Lawrence I., P. Slattery, Dive 2, July 9, 1980 - 2 females. Punuk I., 5 m dive, gravel, P. Slattery coll., July 6, 1983 - 11 specimens, including females, males and im.

SE Alaska, ELB Stn. A48, Icy Strait, sand and gravel at LW level, June 17, 1948 - 5 females.

BRITISH COLUMBIA.

North-central coast: ELB Stn. H25 (Cox Pt. Inlet), 6 m dredge, muddy sand, July 18, 1964 -7 im; H48 (Goose I.), 8 m dredge, sand, kelp, Aug. 5, 1964 - 2 females. **Paratypes** (slide mounts), CMN Cat. no. NMCC1955-0082. Swanson Bay, C. Levings Stn. 51B-031, Apr. 4, 1973 - 1 im.

Vancouver I., north end: ELB Stn. V20 (Brown Bay), coarse sand at LW, June 22, 1959 - 1 female ov, **Holotype** (slide mount), CMN Cat. no. NMCC1995-0081.

Vancouver I., south end: ELB Stns., July 5, 1976: B16 (off Bordelais I.), 44-50 m dredge, sand and gravel- 4 females ov.; B20 (off Long Beach, Trevor Channel), 30 m dredge, gravel - 2 females ov.

Diagnosis. Female ov (3.0 mm): Head, eye medium large, nearly round, black. Antenna 1, peduncular segment 2 long, length nearly equal to segment 1; flagellum 15-segmented. Antenna 2, peduncular segments 3 & 4 slender, subequal; flagellum 10-segmented.

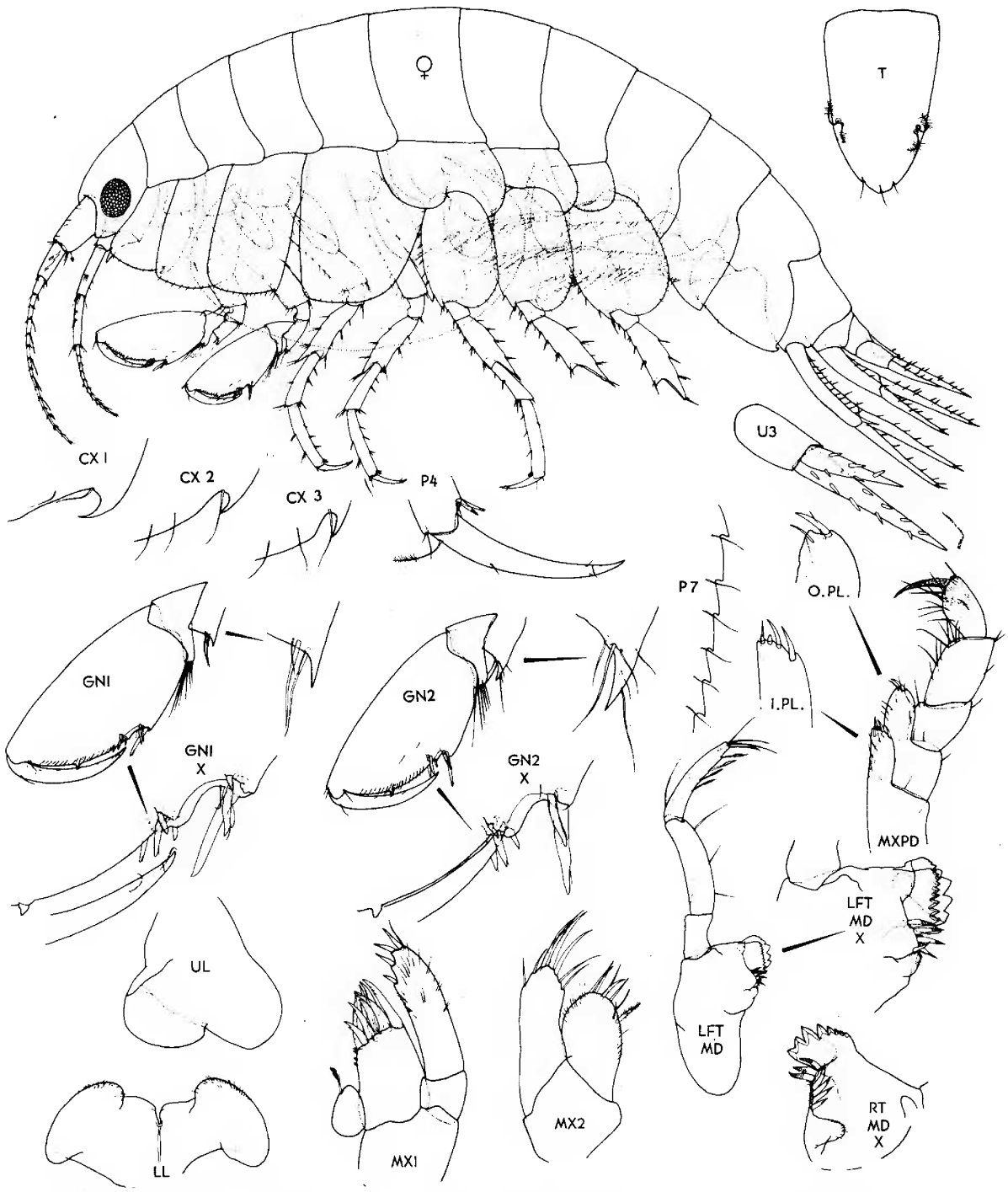

FIG. 3. *Parapleustes americanus,* new species. Female ov (3.0 mm). Brown Bay, B. C.

Upper lip, epistome tall, lobes asymmetrical. Lower lip, inner lobes medium broad, outer lobes normally oblique. Mandible, molar small, thumblike; spine row with 5-7 medium blades; incisor, cutting edge with 8 distally small teeth; palp segment 3 slender, basal "A" seta elongate; inner distal margin with 4 pectinate "D" spines; left lacinia 10-dentate, distal teeth small. Maxilla 1, inner plate with single apical seta; palp, apex obliquely truncate, with 4 slender spines. Maxilla 2, inner plate short, broad, inner margin with single plumose seta. Maxilliped, inner plate with single inner marginal seta, and 1 apical marginal button spine; outer plate short, apex with single curved spine; palp segment 3 large; dactyl slender, nearly straight.

Coxae 1-3 medium broad, lower margins slightly convex, hind corners each with single prominent cusp. Gnathopod 1, basis with antero-distal setal cluster; merus, postero-distal process strong; carpus short, deep, hind lobe narrow; propod medium large, subovate, slightly expanding distally, length ~ 2X depth, inner face smooth; palmar margin oblique, convex, postero-distal angle with clusters of 4 spines on

either side of pronounced dactyl-tip depression; dactyl slender, with short terminal nail. Gnathopod 2 closely similar, propod slightly smaller.

Peraeopods 3 & 4 slender, segment 5 long (~ segment 4) marginal spines slender; dactyls medium long. Peraeopods 5-7 slightly increasing in size posteriorly; bases medium broad, postero-distal lobes medium deep, hind margins gently convex; distal segments slender, segment 5 long (~ segment 4); dactyls medium.

Pleon plate 3, hind corner with small hook. Uropods slender, spinose. Uropod 1, outer ramus slightly the shorter. Uropod 2, outer ramus distinctly the shorter. Uropod 3, outer ramus short, length ~60% slender inner ramus having 5=4-5 pairs of marginal spines. Telson narrowing gradually to subacute apex.

Distribution. From the Bering Sea, and southeastern Alaska to southern British Columbia, subtidally to depths of 50 m at southern locations, mainly on coarse sand and gravel bottoms.

Etymology. The species name alludes to its distribution along the American coast of the North Pacific Ocean.

Taxonomic commentary. In most character states, including the gnathopod propods and the unshortened segment 5 of peraeopods 3 & 4, *Parapleustes americanus* is similar to the type species, *P. gracilis,* from the North Atlantic region. These two species had been synonomized by Barnard & Karaman (loc. cit.). However, in *Parapleustes americanus*, the hind cusps of coxae 1-3 are more pronounced, urosome 2 is nearly occluded dorsally and, in uropod 3, the inner ramus is relatively short.

Some morphological differences have been noted between material from the Bering Sea and from southern parts of its range in British Columbia. These are here considered regional variations, not of species significance.

Chromopleustes, new genus

Parapleustes Stebbing 1906: 312 (part).—Gurjanova, 1951: 648(part).—Barnard 1969a: 425 (part).—Barnard & Karaman, 1991: 649 (part).
Parapleustinae: *oculatus* group, Bousfield & Hendrycks, 1994:42.

Type species. *Parapleustes oculatus* Holmes, 1908.

Species composition. *Chromopleustes johanseni,* Gurjanova, 1951; *C. lineatus,* new species (p. 78).

Etymology. a combining form of the Greek "*kromos*" referring to the remarkably disruptively banded and striped external body colouration, and the generic name "*Pleustes*".

Diagnosis. Body smooth above. Head, rostrum very short; inferior antennal sinus short, nearly right-angled. Eyes large, nearly round. Antennae well-developed, slender, very weakly setose and/or spinose; flagella elongate. Antenna 2 distinctly the shorter; accessory flagellum extremely minute or lacking.

Mouthparts strongly modified. Upper lip deeply notched, lobes markedly asymmetrical. Lower lip very wide, deep, outer lobes slender, rounded very oblique. Mandible, left incisor with numerous (>15), right incisor with 9-12, dentations or serrations; left lacinia multicuspate (>20); blades tall, slender, numerous (10-15), some with basal "satellite" setae; palp segments relatively short, segment 2 medially sparsely setose. Maxilla 1, apical spines of outer plates numerous (13-17), slender tall; inner plate with single minute apical seta; palp distally widened, with 6-8 apical spines and several closely subapical setae. Maxilla 2, inner plate not broadened, inner marginal plumose setae slender. Maxilliped, segment 3 (outer plate segment) strikingly enlarged, much longer and larger than palp segment 1; segments 2 & 3 short, dactyl strong; inner plate with 2-3 stout inner marginal setae.

Coxal plates medium, little (or not) deeper than corresponding body plates; coxa 1 not broadened or bent distally; postero-distal notch single, minute. Gnathopods small to medium strong, distinctly sexually dimorphic; propod and carpus elongate (especially in female), shorter, broader and stouter in male; palm of propod much shorter than posterior margin, straight, oblique, lined with short setae, lacking median tooth; carpal lobe shallow, medium to broad. Gnathopod 1, basis with proximo-posterior "hump".

Peraeopods 3-7 stout, medium long, weakly spinose, segment 5 strong; dactyls short, strong. Peraeopods 3 & 4, margins weakly spinose, lacking special setae. Peraeopods 5-7 regularly homopodous, bases somewhat narrowed behind.

Pleon side plates very broad, medium deep, hind corners acuminate but not produced. Pleopods normal, strong, not sexually dimorphic. Urosome short, segment 2 not occluded dorsally. Uropods regularly spinose; rami of uropods 1 & 2 distinctly longer than respective peduncles; outer ramus slightly the shorter. Uropod 3, rami much longer (3X) than peduncle, outer ramus distinctly the shorter. Telson medium-long, rounding apically. Coxal gills large, platelike.

Taxonomic commentary. Within the subfamily Parapleustinae, the genus *Chromopleustes* appears to be closest morphologically to the genus *Incisocalliope*, on the apomorphic side, and to *Gnathopleustes* on the plesiomorphic side. It is distinguished from the latter, however, rather superficially by the more slender antennae; longer, less spinose legs with shorter dactyls; more elongate uropods, and more striking, disruptive body colouration. In detailed characterization, it is most distinct (unique) in the form of the mouthparts, with specialized proliferation of pectinate spines, blade spines, and multi-dentate incisors and lacinia mobilis.

To date, members of the genus have not been recorded outside the North Pacific coastal marine region, on both Asiatic and N. American coasts.

KEY TO KNOWN SPECIES OF *CHROMOPLEUSTES*

1. Eye small, remote from anterior head margin; antenna 2, flagellum <30-segmented; uropod 3, inner ramus with few (4-5) pairs of marginal spines; maxilliped, palp segment 1 longer than 2; Asiatic Pacific ..... *C. johanseni* (p. 77)
—Eyes large, near anterior head margin; antenna 2, flagellum >30-segmented; uropod 3, inner ramus with 8-10 pairs of marginal spines; maxilliped, palp segment 1 shorter than 2; North American Pacific .. 2.

2. Gnathopod 2, propod slender (both sexes), length >2X depth; telson elongate, length >2X width; mandible, left lacinia with about ~40 marginal teeth; maxilliped, inner plate with 3 inner marginal setae; telson elongate, length >2X width ..... *C. oculatus* (p. 74)
—Gnathopod 2, propod stout (both sexes), length <2X depth; telson short, length ~1.5 X width; mandible left lacinia with about 20 marginal teeth; maxilliped, inner margin with stout single blade adjacent to facial seta; telson short, length ~1.5 X width ..... *C. lineatus* (p. 78)

Chromopleustes oculatus (Holmes)
(Fig. 4, 5, 6, 7)

Neopleustes oculatus Holmes, 1908: 531, figs. 36, 37.
Parapleustes oculatus Barnard & Given, 1960:1.—Barnard, 1969b: 198 (key).—Bousfield, 1985: 31, fig. 1.—Staude, 1987: 379.—Barnard & Karaman, 1991: 650.

Material examined: Nearly 60 specimens in 15 lots ALASKA. (numbers of specimens in parentheses):
Bering Sea: Amchitka I., Aleutians Ids., C. E. O'Clair Sta. IA-2, Oct. 23, 1972 - 1 im.
Southeastern Alaska, ELB Stns, 1961: A3(70); A6(2); A18(2); A57(1); A168 (8); A174 (13); A175 (31); Stn. A8 (Tongass Narrows, opposite Ketchikan), rock and sand at LW, June 3, 1961 - 1 male (slide mount),(fig.'d); female ov. (slide mount),(fig'd specimen), + 15 male, female specimens. ELB Stn. S19B1 (Kameno Pt., near Sitka), July, 1980 -1 male, 2 im.
K. E. Conlan Stns., 1989: Torch Bay, 4.6-13.7 m, June 18 - male, female; Baranof I., Whale Bay, 4.5 - 6 m, June 21 - 1 male; Boca de Quadra, 30.5 m dredge, June 27 - 3 females; Frederick Sound, Brothers I., 5-6 m., P. Slattery coll., Mar. 24, 1988 - 8 males, females.

BRITISH COLUMBIA.
Queen Charlotte Island, ELB Stns, 1957: N2a (Parry Passage) 22 males, females; W8 (2); W15b(2). Naden Harbour, 9 m dredge, Sept 16, 1955 -1 female.
North-central coast: ELB Stns, 1964: H3 (40); H5 (50); H7(6); H12(14); H29 (15); H33(30); H50 (60); H53 (16); H57 (2); H65 (7).
South-central coast: Sutton I., Sechelt Narrows, 15 m dive, Neil McDaniel coll., July , 1978 - 1 male, 1 female, 7 im.
Vancouver I., north end: ELB Stns., 1959: O3 (15); O5 (9)O7b (15); V20 (Brown Bay) (9); V5 (Nigei I.) (2).
Vancouver I., south end: ELB Stns. 1955: F1 (1);F2 (1); F4 (3); P4 (9); P7 (2); ELB Stns., 1976: B4 (1); B5 (2); B8 (5); B21b (1).

CALIFORNIA:
Off Del Mar, 20 m, R. Rosenthal coll., June, 1969 - 6 im.

Diagnosis. Male (8. 2 mm): Head, eye large, broadly ovate, black. Antenna 1, flagellum with ~60 small segments; accessory flagellum minute. Antenna 2. peduncle 5 distinctly longer than segment 4; flagellum with ~45 small segments.

Upper lip, median notch V-shaped, half depth of labrum. Lower lip, inner lobes very broad. Mandible, spine row with 14-15 slender blades; incisor cutting edge nearly straight, with 25+ teeth, strongest proximally; left lacinia, cutting edge slightly concave, with ~50 fine teeth; palp segment 3 with 12 pectinate inner marginal and 3 long terminal setae. Maxilla 1, inner plate with single short apical setae; outer plate with 12-13 slender apical spines; palp segment 2 slightly widening distally, with 8-9 apical short spines. Maxilla 2, outer plate not wider than inner. Maxilliped, inner plate medium, with 3 ordinary inner marginal setae and 5 small apical denticles; outer plate medium, apex obliquely truncated; palp segment 1 shorter than 2.

Coxae 1-3 relatively narrow, lower hind corner of each with minute cusp. Gnathopod 1, hind margin of basis with distinct proximal "hump"; carpus short, slightly longer than deep; propod slender, longer than deep; palm margin oblique, convex, merging imperceptibly with hind margin, postero-distal angle with 3+1 groups of short spines. Gnathopod 2, carpus short, little longer than deep; propod slender, length > 2X depth; palmar margin very oblique, merging with hind margin, postero-distal angle with 4 groups of spines and 2 singly inserted spines.

Peraeopods 3 & 4 slender; segment 6 with 8-10 posterior margin spine groups; dactyls very short, little curved. Peraeopods 5-7 closely homopodous in form and size; bases not strongly broadened, lower hind lobes shallow; dactyls very short.

Pleon plate 3, hind corner weakly acuminate. Uropods 1-3 relatively long, inner ramus > peduncle, margins strongly spinose. Uropod 3, inner ramus > 2.5 X peduncle, margins with 10-12 serial spines. Telson linguiform, length ~2X width, apex rounded.

Distribution. The species ranges from the Bering Sea and southeastern Alaska, south through British Columbia, to California, commonly from LW level to depths of 20 m, in a variety of habitats, associated with *Ulva* and bryozoans.

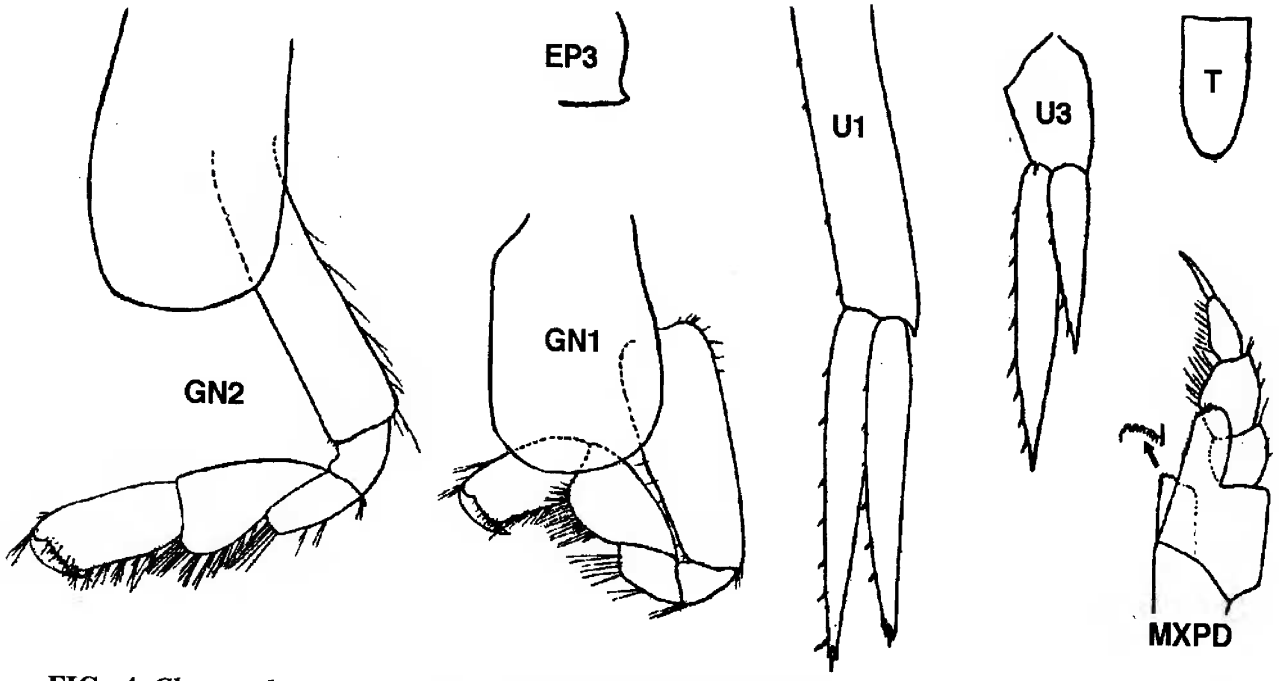

FIG. 4. ***Chromopleustes oculatus*** **(Holmes, 1908). Female (11.0 mm). Monterey Bay, California. (modified from Holmes, 1908)**

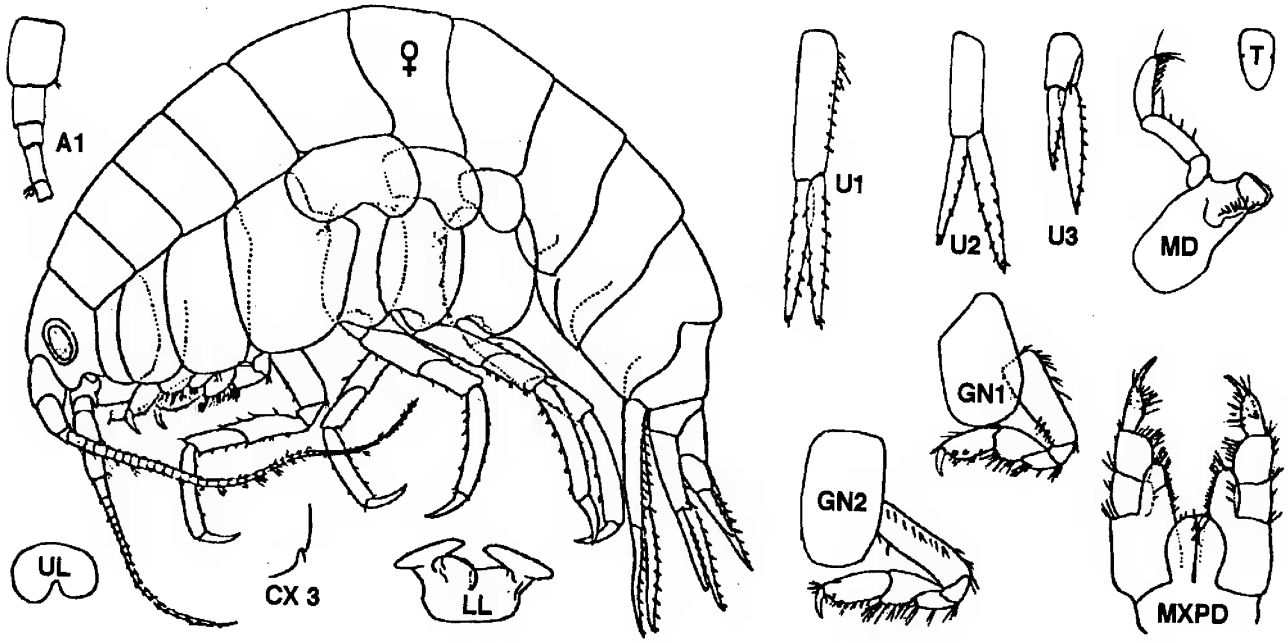

FIG. 5. ***Chromopleustes*** **sp. 1. (Barnard & Given, 1960). Female (6. 5 mm). Santa Monica Bay, 70 m. (after Barnard & Given, 1960)**

Taxonomic commentary. The present female specimens compare closely with the 11.0 mm female illustrated by Holmes (1908) from Monterey Bay (Fig. 4). However, they differ from the small mature female illustrated by Barnard and Given (loc. cit.) from Santa Monica Bay, south of Point Conception, California (Fig. 5). The latter has relatively short antennal flagella, larger and broader coxal plates 1-4, broader bases of peraeopods 5-7, relatively weakly spinose uropod rami, relatively short telson, and much longer inner plate of the maxilliped. In order to clarify its taxonomic status, re-examination of the Santa Monica Bay material would seem desirable.

Chromopleustes oculatus displays a disruptive "saddle back" colour pattern, with dark vertical stripe and bright yel-

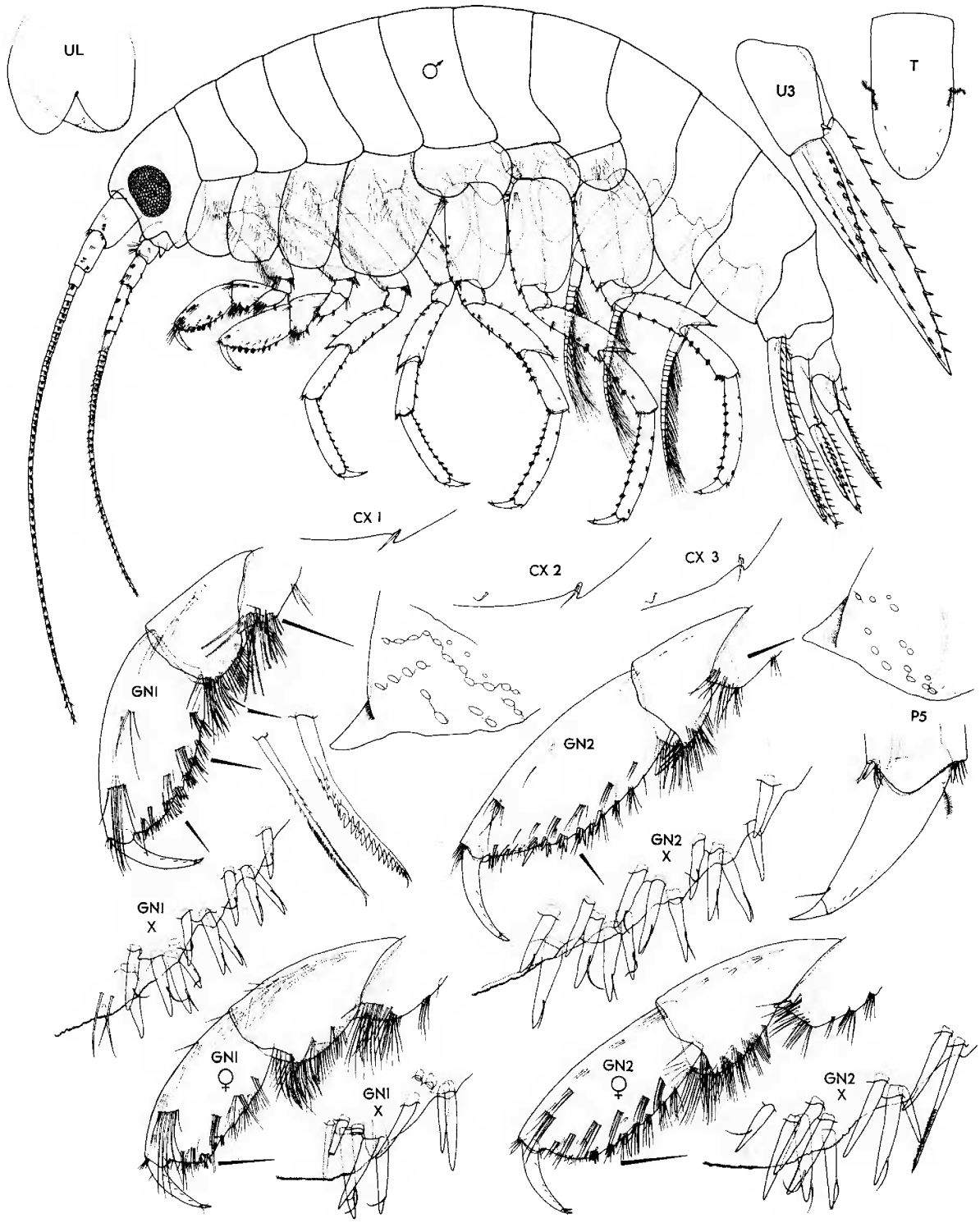

FIG. 6. *Chromopleustes oculatus* (Holmes) Male (8.2 mm); female ov (11.0 mm). Tongass Chan., Alaska

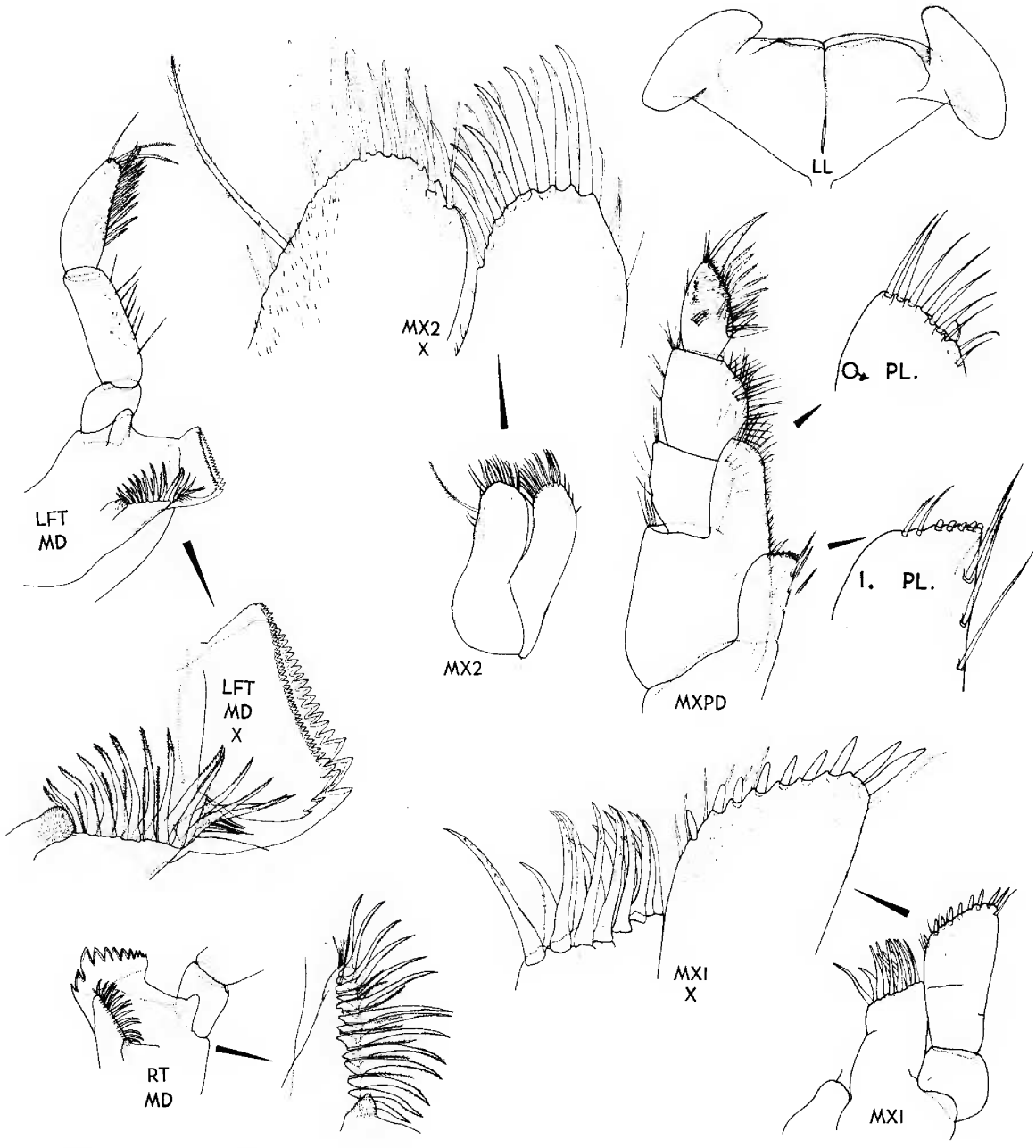

FIG. 7. ***Chromopleustes oculatus*** **(Holmes). Male ov (8.2 mm). Tongass Channel, Alaska.**

low spot on coxa 4 (see Bousfield, 1985, fig. 1), that is one of the most striking of all sublittoral North Pacific amphipods. The "saddle back" spot is wide, extending fully over the dorsum of peraeon segments 5 & 6, but only over segment 5 and half of segment 6 in *C. lineatus*. In *C. oculatus,* moreover, there are 3 dorso-lateral body stripes on each side, vs. 4-5 in *C. lineatus*, and coxal plates 1-3 are white, vs. brownish and vertically striped in *C. lineatus* (p. 81).

As noted elsewhere (Bousfield & Hendrycks, 1994), such may be a form of warning colouration, indicating the presence of terpenes or similar body chemicals that are distateful to fishes and other potential predators.

Chromopleustes johanseni (Gurjanova)
(Fig. 8)

Parapleustes johanseni Gurjanova, 1951: 550, fig. 446.
Parapleustes oculatus Barnard & Karaman, 1991: 650.—Ishimaru, 1994: 54

Diagnosis. (after Gurjanova, 1951): Female (7.0 mm). Head, eyes relatively small, rounded, brownish, remote from the anterior margin by an eye width. Antenna 1 slightly shorter than antenna 2; flagellum 21-segmented. Antenna 2, flagellum 26-segmented.

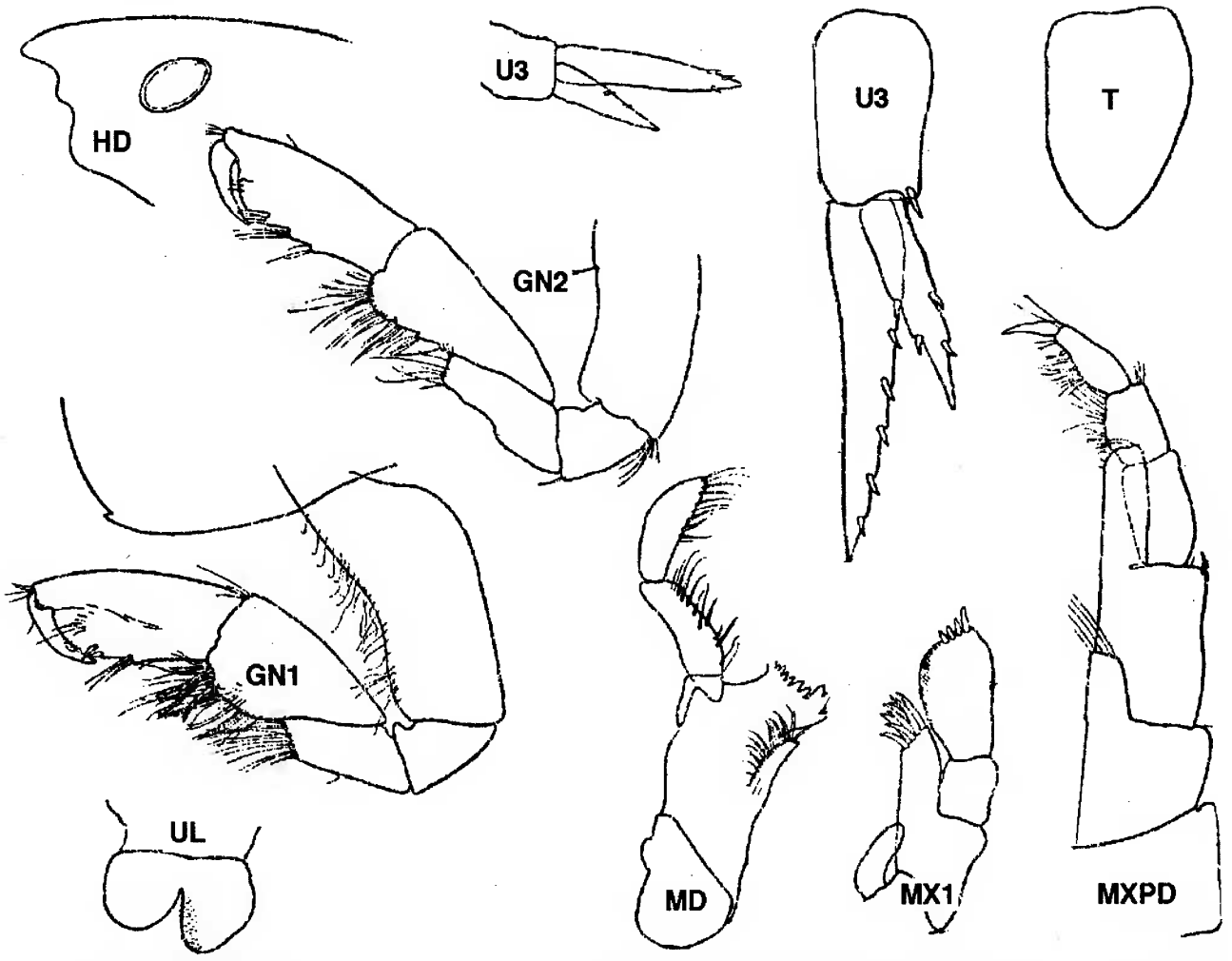

FIG. 8. ***Chromopleustes johanseni*** **(Gurjanova). Female (7.0 mm). Bering Sea. (after Gurjanova, 1951).**

Mandible, spine row with about 20 slender blades; right incisor, cutting edge with 12 teeth, largest proximally; palp segment 3 with 6-8 pectinate "D" spines. Maxilla 1, inner plate narrowly lobate, lacking apical seta; outer plate with 9 apical spines; palp segment 2 inner margin bulging inward, apex with 4 stout spines. Maxilliped, inner plate very short, apex setose; outer plate short, apex obliquely truncate; palp segments 1 and 3 longer than 2 .

Gnathopods slender. Gnathopod 1, basis stout, heavy, posterior margin with strong proximal "hump", anterior margin richly setose; carpus large, longer than deep; propod more slender and a little longer than carpus, length ~2X depth, palm short, convex, oblique, postero-distal angle with few spines. Gnathopod 2, carpus elongate, length > 2X depth, posterior lobe shallow; propod more slender , slightly shorter than carpus, palm convex and more oblique than in gnathopod 1.

Peraeopods 5-7 homopodous, bases broad. Uropod 3, inner ramus narrowly lanceolate, length ~2X peduncle , with 5-6 marginal spines; outer ramus short ~60% of outer ramus, with a few marginal spines distally.

Telson relatively short, length ~1.5 X width, apex broadly acute.

Distribution. Bering Sea and coast of Kamchatka, subtidally on *Alaria fistulosa.* Strictly Asiatic Pacific.

Taxonomic commentary. The species is plesiomorphic in most character states but is distinct in the weakly spinose rami of uropod 3, and very broadened palp of maxilla 1.

Chromopleustes lineatus, new species
(Figs. 9, 10)

Parapleustes oculatus Bousfield, 1985, part.

Material Examined. About 25 specimens in 10 lots:
ALASKA.
Southeastern Alaska: ELB Stn. A171 (Puffin Bay, Baranof I.), rock and algae at LW level, July 25, 1961 - 22 im.; ELB Stns., July, 1980: S7B1 (Dry Pass, Chichagof I.), under boulders, algae, LW - 1 female; S11B1 (Column Pt., Lisianski Strait), bedrock and kelp at LW, July 30, 1980 - ~50 specimens including males and females.

BRITISH COLUMBIA.
North-central coast: ELB Stn. N1 (Rivers Inlet), bedrock,

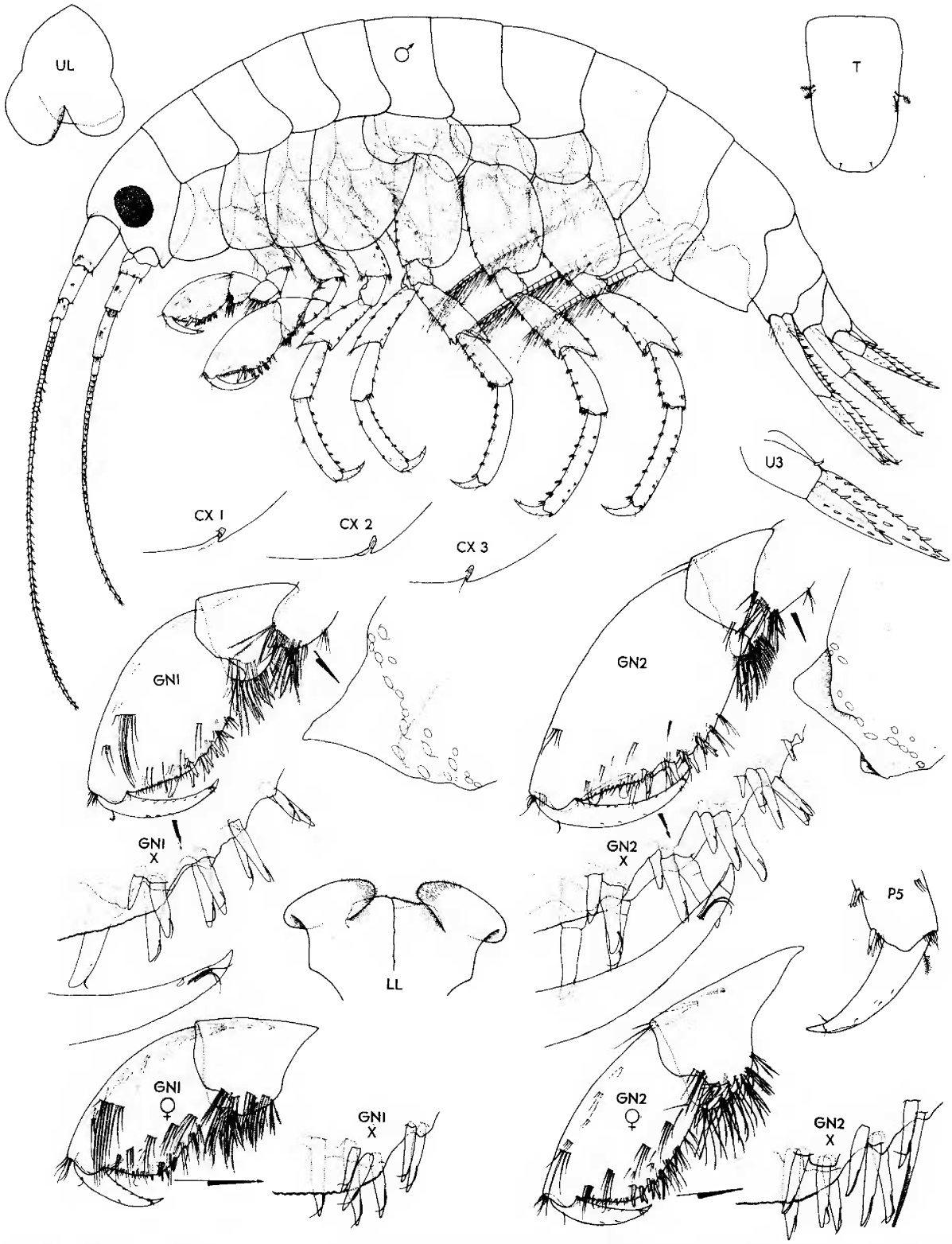

FIG. 9. *Chromopleustes lineatus*, new species. Male (7.5 mm); Female ov (9.0 mm) Ahous Bay, B. C.

Phyllospadix, and coarse sand at LW, Aug. 3, 1959 - 25 specimens, including males, females, im.

Vancouver I., north end: ELB Stn. O5 (Ferrer Pt. beach), under bedrock and kelp at LW, July 20, 1959 - 6 males 2 females, 3 im.

Vancouver I., south end: ELB Stn. O12 (Ahous Bay, Vargas I.), bedrock, *Phyllo-spadix*, sand, at LW, Aug. 18, 1959 - male (7.5 mm), **Holotype** (slide mount), CMN Cat. no. NMCC1995-0071; female ov (9.0 mm), **Allotype** (slide mount), CMN Cat. no. NMCC1995-0072; 7 males, 3 females, **Paratypes**, CMN Cat. No. NMCC1995-0073. ELB Stns., 1975: P5c (Taylor I. Trevor channel), from ascidians and

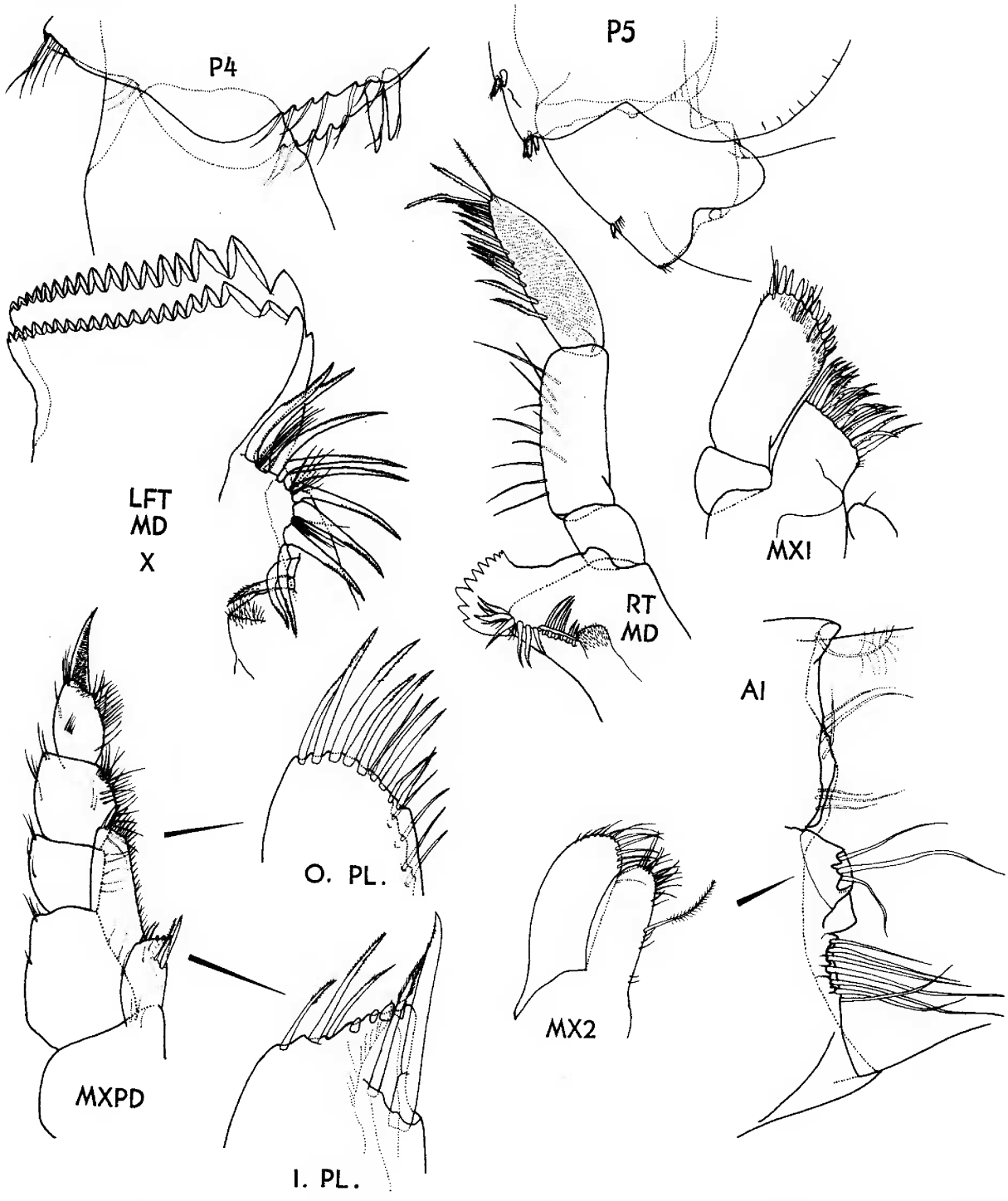

FIG. 10. *Chromopleustes lineatus*, new species. Male (7.5 mm); female ov (9.0 mm). Ahous Bay, B. C.

sponges under large boulders at LW level, - 1 male. ELB Stns., 1976: B7 (Broken Is., Trevor Channel), from sponges under rock, LW level - 9 males 6 females, 6 im. ELB Stns., 1977: B11b (Wickaninnish Bay, south end), from sponges and algae under steep bedrock walls at LW - 1 male, 2 females; B13 (Trevor channel, off Brady's beach), 6-14 m dredge, sand, stone, algae - 1 female ov (14 mm); B14 (Trevor channel, off Execution rock), 44-54 m dredge, sandy mud, algae - 1 female ov.

CALIFORNIA.

Albion Cove, Mendocino Co., from *Tealia* species, 20 m depth, T. Chess coll., Sept. 26, 1978 - 110 females, 20 males.

Diagnosis. Male (7.5 mm): Head, eye broadly ovate, black in alcohol. Antenna 1, flagellum ~60-segmented; accessory flagellum minutely subconical, with 3 apical setae. Antenna 2, peduncular segment 5 little longer than 4; flagellum ~35-segmented.

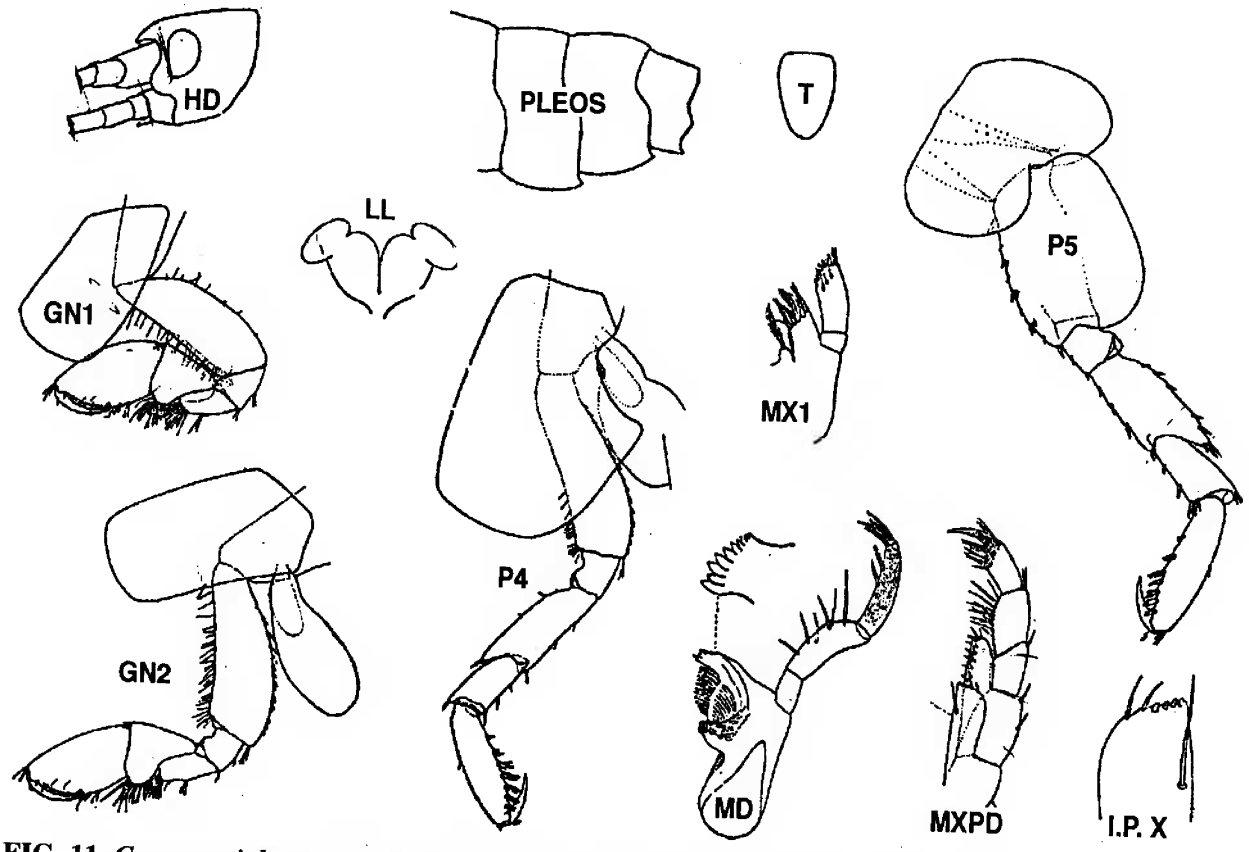

FIG. 11. ***Commensipleustes commensalis*** **(Shoemaker). Female ov (5.5 mm). Point Barrow, Alaska. (after Shoemaker, 1952).**

Upper lip with deep V-cleft separating asymmetrical lobes. Lower lip, inner lobes broad, flat. Mandible, spine row with 11-13 slender blades plus supernumerary setae; right incisor with 9, left incisor with 17 stout teeth; left lacinia with ~20 teeth, distally smallest; palp segment 3 with 10 pectinate "D" spines (of Cole, 1980) and 3 longer apical setae. Maxilla 1, inner plate with single short apical setae; outer plate with ~18 slender apical spines; palp segment 2 apically rounding, with 8-9 short spines. Maxilla 2, outer plate broader than inner. Maxilliped, inner plate with large inner marginal blade-like spine and 4 small apical denticles; outer plate rounded apically; palp segment 1 shorter than 2.

Coxae 1-3 relatively broad, deep. Gnathopods distinctly sexually dimorphic. Gnathopod 1, posterior margin of basis lacking distinct proximal "hump"; carpus short, as deep as long; propod relatively deep, length ~ 1.5 X depth, palm oblique, nearly straight, postero distal angle with 4 groups of spines extending onto posterior margin. Gnathopod 2, propod very short, length distinctly less than depth; propod larger than in gnathopod 1, slightly broadening distally, palm oblique nearly straight, posterior angle with 4 spine clusters and adjacent single small spine on posterior margin; dactyls with minute posterior marginal setules.

Peraeopods 3 & 4, segment 6 relatively short, hind margin with 6-7 spine clusters. Peraeopods 5-7 homopodous, peraeopods 5 slightly the shortest; basis of peraeopod 5 less broadly expanded than in 6 & 7; dactyls medium, gently curved distally.

Pleon side plate 3, hind corner acuminate; uropods 1 &2 slightly shorter and less strong than in *C. oculatus*; inner ramus of uropod 1 with 6-8 serial paired spines. Uuropod 2 Uropod 3, inner ramus, length ~2X peduncle, margins with 8-9 serially paired spines

Telson medium, length 1.5 X width, apex subtruncate.

Female (9.0 mm): Slightly larger and heavier-bodied than male. Gnathopod 1, carpus slightly longer, length slightly greater than depth; propod shorter, length ~ 1.3X depth. Gnathopod 2, carpus not shortened, length ~1.5 X depth; propod subrectangular, not broadening distally.

Distribution. From southeastern Alaska, through the Queen Charlotte islands and north central mainland coast of British Columbia to Mendocino Co., northern California, often in association with sponges, coelenterates and tunicates, on hard bottoms, from LW level in the north, subtidally to depths of over 50 m in the south.

Etymology. from the Latin "*lineus*": meaning lined, alluding to the fine, orange, dorso-lateral body stripes, and verical yellow stripes on brownish coxal plates 1-4.

Taxonomic commentary. The species differs markedly from *C. oculatus* in colour, and from *C. johanseni* in characters of the key (p. 74), and additonally in the highly modified mouthparts, especially the mandible and maxilla 1.

Commensipleustes, new genus

Parapleustes Shoemaker, 1952: 231.—J. L. Barnard, 1969a: (partim).—Barnard & Karaman, 1991: 650.

Type specis. *Parapleustes commensalis* Shoemaker, 1952: 231, fig. 83. (see Fig. 11).

Diagnosis. Head, rostrum about equal to rounded anterior lobe. Eyes medium large, black. Antennae slender, peduncles short, flagella short (<15 segmented).

Upper lip, medium notch shallow, lobes slightly asymmetrical. Lower lip inner lobes deep medium wide, rounded; outer lobes small, ovate, oblique. Mandible, molar process relatively strong, apex slightly triturative(?); spine row with numerous (10+) blades; left lacinia 10-dentate; palp segment 3 slender, with 2 inner marginal pectinate "D" spines. Maxilla 1, inner plate small, with single apical seta; palp segment 1 lacking shoulder seta(e) segment 2 stout, apex obliquely rounded, with 8 short spines, and a facial row of 3 setae. Maxilla 2 , inner plate regular, with single inner marginal plumose setae. Maxilliped, inner plate with 3 apical "button" spines and 2 slender spines; outer plate, apex with 2 slender spines, segment 3 lacking distal pectinations; palp relatively short, curved.

Coxae 1-3 relatively narrow, 1 not expanded distally. Lower margins gently convex, hind cusp minute. Coxa 4 not broader than deep. Gnathopods medium strong, closely subequal, not sexually dimorphic (?). Gnathopod 1, basis, anterior margin strongly short-setose; hind margin weakly so merus lacking distal process; carpus, hind lobe relatively broad, rounded below; propod relatively short, not expanding distally; palm oblique, convex, median tooth apparently lacking.

Peraeopod 3 & 4, basis, antero-distal margin with short setae; segment 5 short, length < segment 4; segment 6 stout, hind margin distally with groups of stout spines against which the dactyl closes, forming a grasping organ. Peraeopods 5-7 homopodous, short, stout; bases medium; segment 5 short; segment 6, anterior marginal spines and dactyl forming a grasping organ, as in peraeopods 3 & 4.

Pleon plates 2 & 3, hind corners mucronate, slightly produced. Uropods 1 & 2, relatively short, little or not exceeding uropod 3. Uropod 3, inner ramus relatively long.

Telson linguiform, medium, distally narrowing to rounded apex.

Distributional ecology. *Commensipleustes commensalis*, the only known species, occurs on pleopods of the spiny lobster, *Panulirus interruptus*, off Santa Barbara, CA. Also recorded by Wicksten (1982) off southern California.

Taxonomic commentary. The prehensile peraeopods, in combination with the short peraeopodal segment 5, unexpanded coxa 1, and specialized mouthparts are here deemed sufficient for separate generic recognition.

Gnathopleustes, new genus

Parapleustes Gurjanova, 1972: 131 (part).—Barnard, 1969b: 203 (part).—Barnard & Karaman, 1991: 649 (part).
Neopleustes Stebbing, 1906: 311 & 728 (part).
Parapleustinae, group 1 (part) Bousfield & Hendrycks, 1994: 42.

Type species. *Iphimedia pugettensis* Dana, 1853, original description.

Species. *Gnathopleustes serratus*, new species (= *Parapleustes pugettensis* Shoemaker, 1964); *G. den* (Barnard, 1969b); *G. pachychaetus*, new species; *G. trichodus*, new species; *G. simplex*, new species.

Diagnosis. Body smooth above. Head, rostrum shorter than bluntly rounded anterior lobe; inferior antennal sinus broadly incised. Eyes medium large, subrotund. Antennae well-developed; posterior margins often setose. Antenna 1 the longer, peduncular segment 2 short; accessory flagellum minute, apex 2-3 setose. Antenna 2, peduncle strong, flagellum often with special thickened setae.

Mouthparts strongly modified. UL shallowly notched, lobes asymmetrical. Lower lip broad, outer lobes rounded, oblique. Mandible: incisor regularly toothed; left lacinia 7-10 dentate; blades 4-12 in number, stout, distally chisel-shaped; molar body reduced, slender, apex fuzzy; palp normal, segment 1 short, segment 2 medially setose. Maxilla 1, outer plate with 9 tall slender apical spines; palp with subapical facial setae. Maxilla 2, inner plate little expanded; maxilliped, palp strongly dactylate, segment 2 largest; outer plate segment longer than palp segment 1, not enormously developed; inner plate short, inner marginal setae numerous (4-9).

Coxal plates wide, deeper than corresponding body plates; coxa 1 broadened distally, hind margin spinose near basis, postero-distal notch single, small. Gnathopods 1 & 2 large, subequal (Gnathopod 2 larger), variously sexually dimorphic; basis stout, with antero-distal setal group; merus with slight distal process; carpus, posterior lobe short, deep (especially in male); propods subovate, palms strongly oblique, elongate, convex, palmar tooth distinct, near hinge; palmar margin tending to be lined with special thickened or blade-like setae; postero-distal angle with 2-4 groups of spines, hind margin short, bare, or longer, setose.

Peraeopods 3-7 stout, spinose, normal; segment 5 strong, moderately overhung proximally by segment 4; dactyls medium strong, curved. Peraeopods 3 & 4, margins of segments 4, 5 & 6 may bear special thickened setae. Peraeopods 5-7 regularly homopodous, bases broad, convex behind.

Pleon side plates broad, deep, hind corners acuminate but not strongly produced. Pleopods strong, normal, not sexually dimorphic. Urosome short, segment 2 nearly occluded dorsally. Uropods 1 & 2 regularly spinose; uropod 1, rami

KEY TO KNOWN SPECIES OF *GNATHOPLEUSTES*

1. Antenna 2 about 10-15% shorter than A1, flagellum moderately to strongly setose posteriorly; gnathopods tending to strong sexual dimorphism, palmar margins heavily lined with blade-setae or split-tipped setae in male . . . . . 2.
—Antenna 2 short, only 25-50% length of antenna 1, flagellum nearly bare (short setae only); gnathopods pods slightly sexually dimorphic, palmar margins lined with relatively few normal setae . . . . . 5.

2. Gnathopods (male), palmar and posterior margins heavily lined with split-tipped setae; mandible, blade row of 10-12 unmodified blades; antenna 1 (male), flagellum brushy. . . . . *G. simplex.* (p. 87)
—Gnathopods (male), margins lined with "balloon" setae (pachychaete); mandible, blades (especially dist ally) modified; antennal setation weak, with no distinct "brush" (setose on hind margin only) . . . . . 3.

3. Antennal peduncles spinose, lacking setae; peraeopods 3-7 all lacking marginal setae; gnathopod palms strongly setose, ... *G. den* (p. 85)
—Antenna peduncles spinose and setose (flagella of A2 variously setose); peraeopods 3-4 or 5-7 strongly setose behind; gnathopod palms strongly setose (with "balloon" setae) . . . . . 4.

4. Gnathopod 2, palmar margin distinctly concave, postero-distal angle with 2 spine groups; peraeopods 5-7, hind margins of segments 4-6 with clusters of long brushlike setae (male); uropod 3, outer ramus with 6-9 marginal spines; antenna 1, peduncular segment 1 not elongate . . . . . G. *trichodus* (p. 91)
—Gnathopod 2, palmar margin nearly straight, postero-distal angle with 3-4 spine clusters; peraeopods 5-7, hind margins of segments 4 - 6 with spine clusters only (lacking setae); uropod 3, margins of outer ramus with 5-7 spines only; antenna 1, peduncular segment 1 long . . . . . *G. pachychaetus* (p. 87)

5. Gnathopods, dactyls smooth behind; telson less than twice as long as wide; peraeopods 5-7, segment 5 distinctly shorter than 4, strongly overhung posteriorly by segment 4 . . . . . *G. pugettensis* (p. 83)
—Gnathopods, dactyls posteriorly finely serrate; telson elongate, at least twice as long as wide; peraeopods 5-7, segments 4 & 5 subequal in length, 5 normally overhung by 4 . . . . . G. *serratus* (p. 91)

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subequal; uropod 2, outer ramus the shorter. Uropod 3, outer ramus distinctly the shorter. Telson elongate, narrowingdistally; dorsal penicillate setae about mid-point from base. Coxal gills large, broad.

Taxonomic commentary. Members of *Gnathopleustes* overlap to considerable degree with members of *Incisocalliope* . However, the two genera are maintained as distinct units for the present because they can be keyed, and the distributions are discreet. Within *Gnathopleustes,* two main subgroups can be distinguished, as outlined in the key below. In the more advanced members (*G. pugettensis, G. den, G. simplex*) the gnathopods appear very slightly sexually dimorphic, and the mouthparts, peraeopods and uropods are apomorphic.

Distributional commentary. Members of the genus are restricted almost entirely to the Pacific coast of North America, from southeastern Alaska to southern California. *Gnathopleustes pugettensis* has been reported, but not confirmed, from Japanese waters by Irie & Nagata (1962).

Gnathopleustes pugettensis (Dana)
(Fig. 12, 13)

Iphimedia pugettensis Dana, 1853: 932, pl. 63, fig. 6.
Neopleustes pugettensis Stebbing, 1906: 728.
Parapleustes pugettensis Barnard, 1969b: 203.—Austin, 1985: 592.—Staude, 1987: 379.—Barnard & Karaman, 1991: 650.
non *Incisocalliope newportensis* Barnard, 1959: 22.
non *Parapleustes pugettensis* Barnard & Given, 1960: 43. —Ishimaru, 1984: 19.

Material examined. 258 specimens in 38 lots:
ALASKA.
Southeastern Alaska. ELB Stns, June-July, 1961: A40 (4 + slide mount); A80 (1); A164 (1); A171 (1).

BRITISH COLUMBIA.
Queen Charlotte Islands. ELB Stns., July-August, 1957: W11 (6) W15b (1).
North-central coast, ELB Stns., July, 1964: H43 (1); H53 (1); W64 (2).
Northern and central Vancouver I.: ELB Stns., 1959: H10 (40 specimens including males and females); N16 (1); V4b (Hope I., Roller Bay), under boulders, kelp, *Phyllo-spadix,* at LW level - male (slide mount) **(fig'd specimen)**; female (slide mount) **(fig'd specimen)** + 8 other specimens; V10(10); V17 (1); V19 (1).
Southern Vancouver I.: ELB Stns., 1955: P9(1). ELB Stns, 1970: P702 (20); P707 (5); P710b (1); P714 (1); P719 (5, including females ov.). ELB Stns, 1975: P2 (25); P3a (1); P5a (1); P5b (1). ELB Stn. B4 , off Brady's Beach, 60-70 m

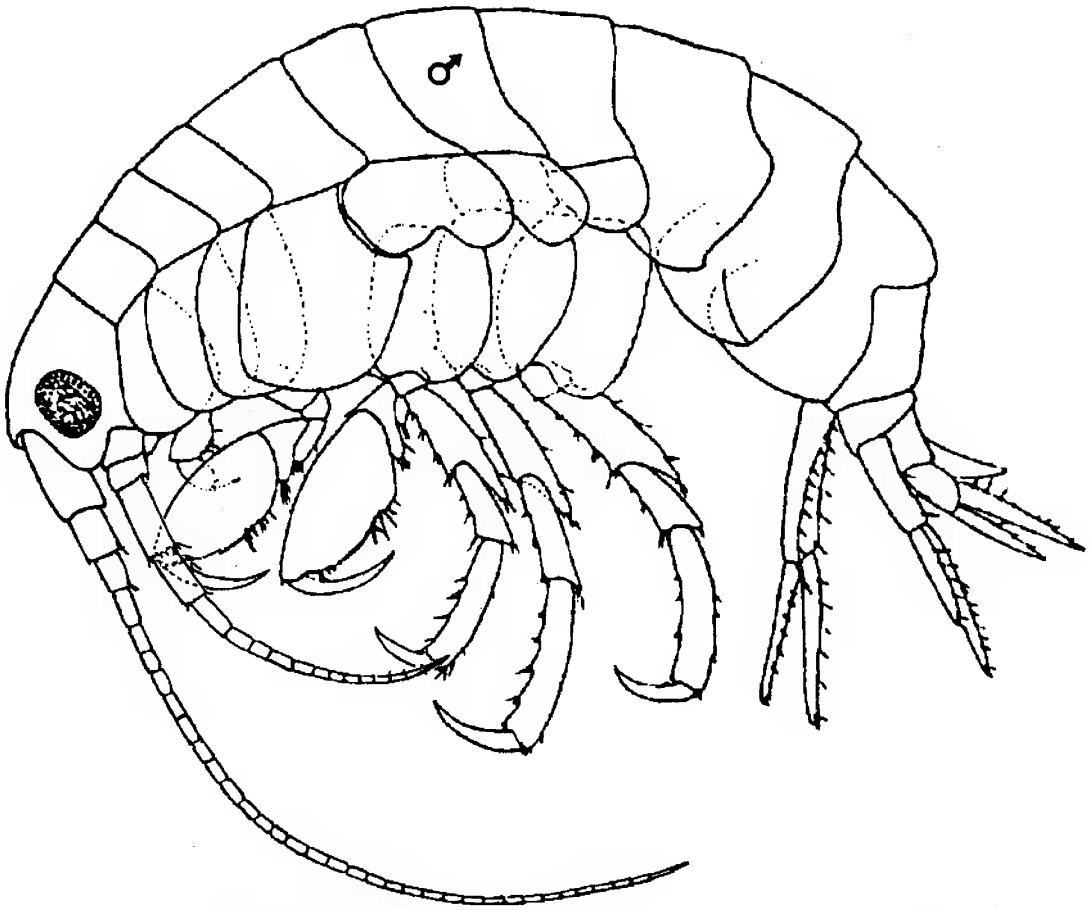

FIG. 12. *Gnathopleustes pugettensis* (Dana). Male (4.0 mm). Southern California. (modified from Barnard & Given (1960).

naturalist's dredge, sand and algae, June 25, 1976 - 2 females. ELB Stns., 1977: B8 (5); B14 (1).

WASHINGTON-OREGON:
Strait of Juan de Fuca to Newport. ELB Stns., July-Aug., 1966: W22 (30, including slide mount); W30 (1); W34 (11); W35 (9); W36(8); W40 (19); W50 (30, + slide mount); W53 (1); W57 (1); W63 (6); W66 (2).

Diagnosis. Male (6.0 mm): Body relatively short, coxal and pleon plates deep. Head, eye large, subrectangular. Antenna 1, peduncular segment 3 relatively long (1/2 segment 2); flagellum of 35-40 medium long segments; accessory flagellum conical, apex with single long seta. Antenna 2, peduncular segment 5 shorter than 4; flagellum with ~35 nearly marginally smooth segments.

Upper lip strong, asymmetrical. Lower lip, inner lobes deep; outer lobes normally oval, oblique. Mandible, molar short, blunt; spine row with 8-10 stout, abruptly acute blades; incisor, cutting edge with 6 uneven teeth; palp segment 3 with 8 inner marginal pectinate spines; left lacinia with 8 unequal teeth. Maxilla 1, palp segment 2 with 4 unequal apical spines. Maxilla 2, outer plate not narrowing distally, apex strongly setose. Maxilliped, inner plate relatively large, distally broad, with 7 distal facial setae, and 4 small apical marginal denticles; outer plate regular, apex subtruncate; palp, dactyl slender, curved.

Coxae 1-3 relatively large, deep; coxa 5 deep. Gnathopod 1, carpus medium, about as deep as long, carpal lobe medium; propod smoothly ovate, palmar margin convex, very oblique, postero-distal angle with groups of 4 and 3 spines and a single spine distally on posterior margin; dactyl, hind margin not serrated, with a few setules only. Gnathopod 2, carpus and dactyl slightly larger, but proportions and armature similar to that of gnathopod 1.

Peraeopods 3 & 4 relatively short, distal segments (4/6) weakly marginally spinose; dactyls medium, > 1/3 length of segment 6. Peraeopods 5-7 closely homopodous, 5 slightly smallest; bases broadly expanded, hind margins convex; distal segments (4-6) weakly marginal spinose, not setose; dactyl medium.

Pleon plates 1-3 deep, broad, hind corner of 3 squared. Urosome 2 occluded dorsally by 1 & 3. Uropods ordinary. Uropod 1, peduncular postero-distal spine strong. Uropod 2, outer ramus short, length ~2/3 inner ramus. Uropod 3 strong, inner ramus >2 X peduncle, margins with 5 spines.

Telson subrectangular, length about 1.5X width, apex truncate.

Female (5.5 mm): Gnathopods not described, presumably slightly smaller and less setose than in male.

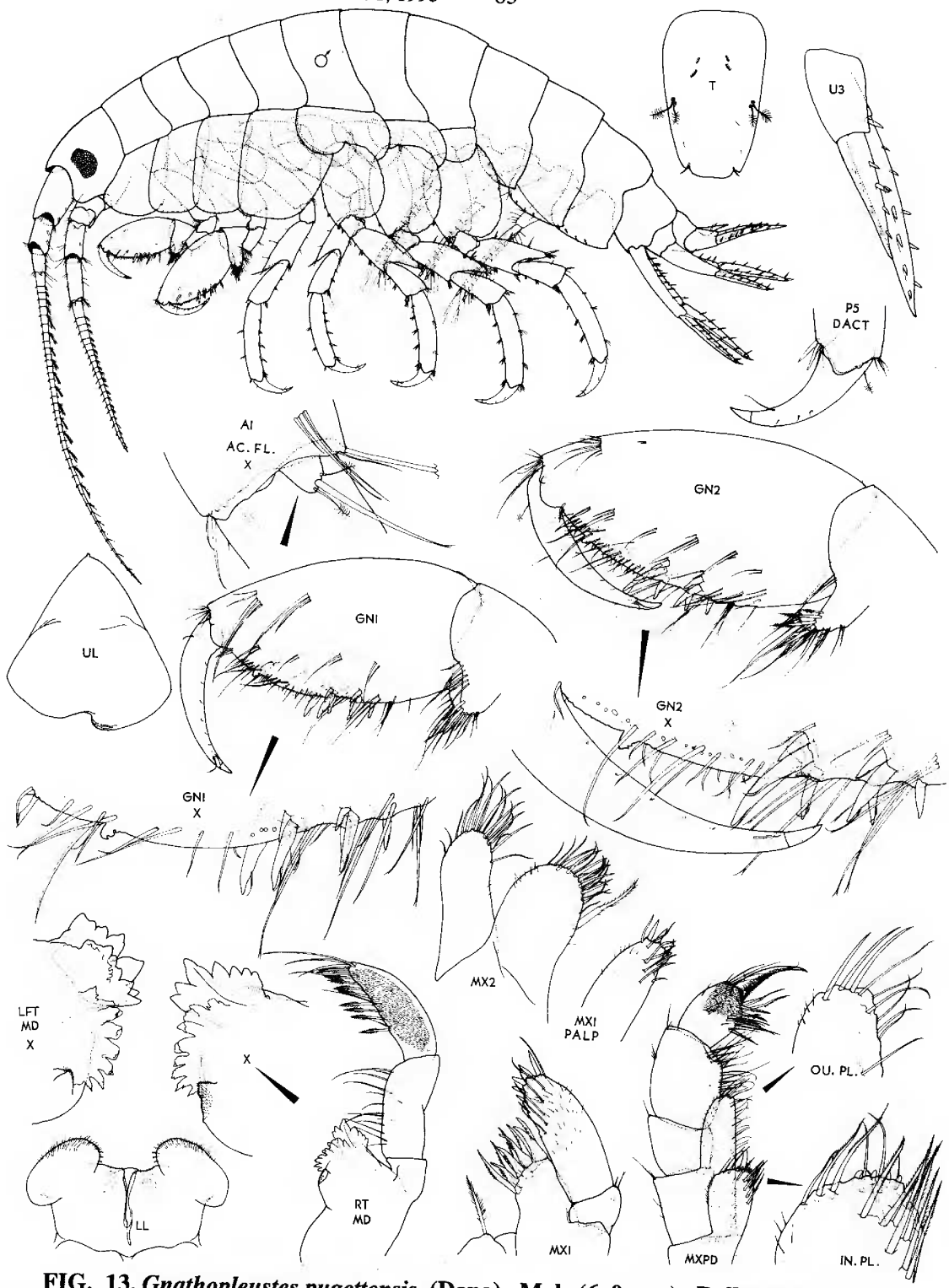

FIG. 13. *Gnathopleustes pugettensis* (Dana). Male (6. 0 mm). Roller Bay, B. C.

Distribution. From southeastern Alaska and northern British Columbia south through Washington & Oregon to Point Conception and Santa Barbara regions, subtidally to 70 m; replaced by *I. newportensis* south of Pt. Conception.

Taxonomic commentary. *Gnathopleustes pugettensis* is the generic type and, in balance of character states, is most advanced. Overall, it is closely similar to *G. den* and *G. simplex*\.

Gnathopleustes den (Barnard)
(Fig. 14)

Parapleustes den J. L. Barnard, 1969b: 199, fig. 54.—Staude, 1987: 319.—Barnard & Karaman, 1991: 650.

Material examined. Male (8.0 mm), **Holotype**, J. L. Barnard Stn. 6, Allan Hancock Foundation Cat No. #559. Material of this species was not found in the study range,

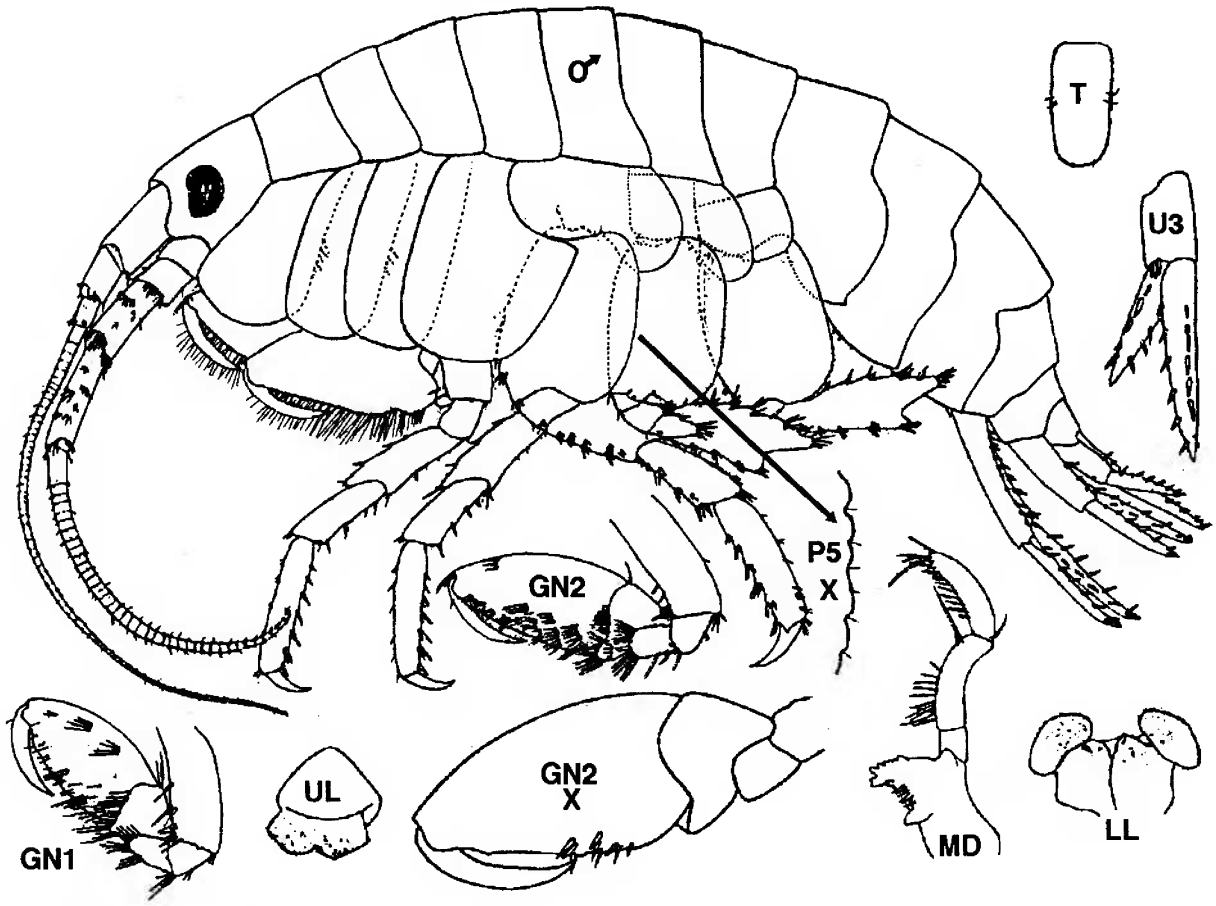

FIG. 14. *Gnathopleustes den* (J. L. Barnard). Male (8. 0 mm). Corona del Mar, California. (after Barnard, 1969b).

despite its close similarity to *G. pachychaetus.*

Diagnosis (partly after Barnard 1969b). Male (8.0 m): Body and coxal plates medium, ordinary. Head, eyes medium, broadly short-reniform. Antenna 1, peduncular segment 3 medium, length 1/2 segment 2; accessory flagellum very short, with 2 slender apical spines; flagellum elongate (59 segments). Antenna 2, peduncular segment 5 not shorter than 4; flagellum with 50+ segments, proximally stoutest, nearly bare.

Upper lip, apical cleft relatively deep, lobes nearly symmetrical. Lower lip, inner lobes deep, outer lobes steeply oblique. Mandible, molar prominent, apex subacute?; spine row with 13-15 medium stout blades; left lacinia 9-dentate; cutting edge of incisor with 6 irregular teeth; palp segment 3 with 11-12 inner marginal pectinate "D" spines. Maxilla 1, palp, apex with 6-7 spines. Maxilliped, inner plate with 1 marginal spines and 2 facial setae; outer plate tall, columnar.

Coxal plates 1-3 large, deep, relatively narrow; coxae 1 distally expanding, 1-3 with 3-4 hind marginal spines; coxa 5, lobes medium deep. Gnathopod 1, carpus medium, length and depth subequal; propod ovate, palmar margin shallowly oblique, very slightly convex, densely finely setose, continuous with hind margin, median tooth very weakly developed; postero-distal angle with 3 groups of spines (?); dactyl stout, hind margin smooth, not serrated. Gnathopod 2, propod distinctly larger and deeper than in gnathopod 2 ; palm nearly horizontal, nearly straight, densely finely setose, with weak median tooth, postero-distal angle with 3 groups of spines, a single distal spine on the posterior margin; dactyl stout, smooth behind.

Peraeopods 3 & 4 strong; segment 6, hind margin with 6 spine groups; dactyl short. Peraeopods 5-7 relatively stout; bases slightly broadest distally, hind margins nearly straight, weakly crenulate; segment 4 broad, width ~2/3 length; segment 6, margins spinose (not setose); dactyls medium, ~ 1/3 length of segment 6.

Pleon plate 3, hind corner acuminate. Urosome 2 with free dorsal margin. Uropods 1 & 2 stout, rami relatively short, not extending beyond uropod 3; uropod 2, rami subequal. Uropod 3, inner ramus with 6-7 pairs of marginal setae.

Telson subrectangular, length ~ 2X width, apex subtruncate.

Female (10.0 mm): Undescribed.

Distribution. Known only from the type locality at Corona del Mar, south of Pt. Conception, California, in washes of tubes of the polychaete *Phragmatopoma* sp., at LW level.

Taxonomic commentary. The type male specimen, figured by Barnard (1969b), differs from *G. pachychetus* in lacking posterior marginal setae on the peduncle of antenna 1, and in lacking brush setae on the flagellum of antenna 2.

Gnathopleustes simplex, new species
(Fig. 16)

Material examined.
BRITISH COLUMBIA:
Southern Vancouver Island: Off Wouwer I., Barkley Sound, P. Lambert coll., June 29, 1973 - male **Holotype** (6.8 mm) RBCM loan No. 973-156.
ELB Stn P17d, Kirby Pt. Bay, Diana I., under-rock habitat among sponges, tunicates, at LW, Aug. 6, 1975 - 1 female ov. (5.0 mm).

Diagnosis. Male (6.8 mm). Body slender coxal and pleonal plates relatively small, shallow. Head, eye medium small, broadly reniform. Antenna relatively short, 1 slightly longer than 2. Antenna 1, peduncular segment 3 short, length 1/2 segment 2; accessory flagellum minute, conical; flagellum with 35 segments, nearly devoid of marginal setae. Antenna 2, peduncular segments 4 &5 short, 5 slightly longer, both with facial clusters of setae; flagellum of 30 weakly brush-like segments, basally stoutest, each with distal cluster of short setae.

Mandible, molar small apically conical; spine row with 10-11 slender blades and a few supernumerary setae; cutting edge of incisor with 6 variably sized teeth; palp segment 3 short, inner margin with 11 pectinate "D" spines; left lacinia with 12(?) teeth. Maxilla 1, palp slender with 4 apical slender spines? Maxilla 2? Maxilliped, inner plate short, broadest medially, with distal facial setae, and 4? apical marginal spinules; outer plate relatively short, distally narrowing, apex rounded; palp, dactyl curved.

Coxae 1-4 medium, 1 & 2 each with 2-3 posterior marginal spines. Gnathopod 1, basis with antero-distal marginal setae; carpus short, deeper than long, hind lobe distally broad; propod short ovate, relatively deep, palmar margin shallowly oblique, nearly straight, moderately marginally simple-setose, with distinct median tooth, postero-distal angle with cluster of 3 spines, posterior margin with single distal cluster of 2 spines; dactyl smooth behind. Gnathopod 2 similar, but large; basis with fewer antero-distal setae; carpus, hind lobe slightly broader; propod more elongate, palmar margin slightly concave; postero-distal angle with cluster of 3 spines; hind margin strongly setose, with distal cluster of 3 spines; dactyl smooth behind.

Peraeopods 3 & 4 ordinary, not setose; dactyls medium. Peraeopods 5-7 bases not strongly broadened, hind margins nearly straight; segment 4 short; segments 4-6 anterior and posterior strongly spinose and setose; segment 6, anterior margin with 6-7 clusters of spines and setae; dactyls medium.

Pleon plate 3 weakly spinose below, hind corner acuminate. Urosome 2 occluded dorsally by segments 1 & 3. Uropod 1, rami not elongate, weakly spinose marginally. Uropod 2, outer ramus distinctly the shorter. Uropod 3 regular(?). Telson medium, narrowing distally 7 to sharply rounded apex.

Distribution. Known only from Barkley Sound, Vancouver I., British Columbia, LW and shallow subtidally, associated with sponges and tunicate, under rocks.

Etymology. From the Latin "simplex", meaning simple, not ornate, with reference to the unshortened, unbroadened blades of the mandibular spine row.

Taxonomic commentary. *Gnathopleustes simplex* encompasses some plesiomorphic character states (e.g., slender mandibular blades) but, in balance of character states, is apomorphic. It appears not unlike *G. pugettensis* and the more southerly *G. den,* in the form of the antenna and other features of the mouthparts, especially the maxilliped.

Gnathopleustes pachychaetus, new species
(Figs. 17,18)

Material examined.
ALASKA.
Southeastern Alaska. ELB Stns., June-July, 1961: A6 (1); A8(4 + slide mount); A130 (4); A171 28 + slide mount). ELB Stns, July, 1980: S4B4 (2); S11B1 (2); S18B1 (1); S22F1 (1).

BRITISH COLUMBIA.
Queen Charlotte Islands. ELB Stns., July-August, 1957: E21 (3); W9 (4). Flamingo Harbour, Stn. 3539, July 17, 1935 - 4 females ov; J FRB Stn. M1-65-55, DBQ, JWS coll., Aug. 6, 1965 - 1 female ov.
North-central coast, ELB Stns., July, 1964: H35 (~100); H39 (15); H40 ~70); H41 (~25).
Northern and central Vancouver I.: ELB Stns, July, 1959: O5 (~15); O17 (7); N18 (17, incl. males and females). R. M. O'Clair Stns, 1976: #760007, Kelsey Bay (1 male; # 760023, Squirrel Cove, Cortez I. - 30 males and female (+ slide mount); #760046, Port Hardy - 1 female ov.
Southern Vancouver I.: ELB Stns, July-August, 1955: P4 (~15); P6a (~40) P6c(~15); F5 (~15); M11 (~30). ELB Stns, 1970; P704 (1); P702 (1); P707 (~25); P708 (1). ELB Stns, 1975: P17d (1 female + slide mount); P5c (5); P20a (1); P20c (2). ELB Stns., 1976: B1 (10); B2 (6); B4 (9); B5 (44); B7 (2); B8 (1); B12b (~160 + slide mounts); B13 (~30)B28 (1). ELB Stns, 1977: B6a (3); B8 (1): B11a (1); B11b (2); B13 (1); B 19b(2). R. M. O'Clair Stns., 1976: #760028, Sturdies Bay, Galiano I. - 9 males & females. # 760031 Miner's Bay, Mayne I. (~30 males, females). #760034, Horton Bay, Mayne I., June 22, 1976 - Male (6.8 mm), **Holotype** (slide mount), CMN Cat. no. NMCC1995-0076; female (5.8 mm), **Allotype** (slide mount), CMN Cat. no. NMCC1995-0077, + 8 males, 12 females, **Paratypes**, CMN Cat. no. NMCC1995-0078. Ogden Pt. breakwater, Victoria, R. J. Long coll., 1976 - 2 females, 1 male.

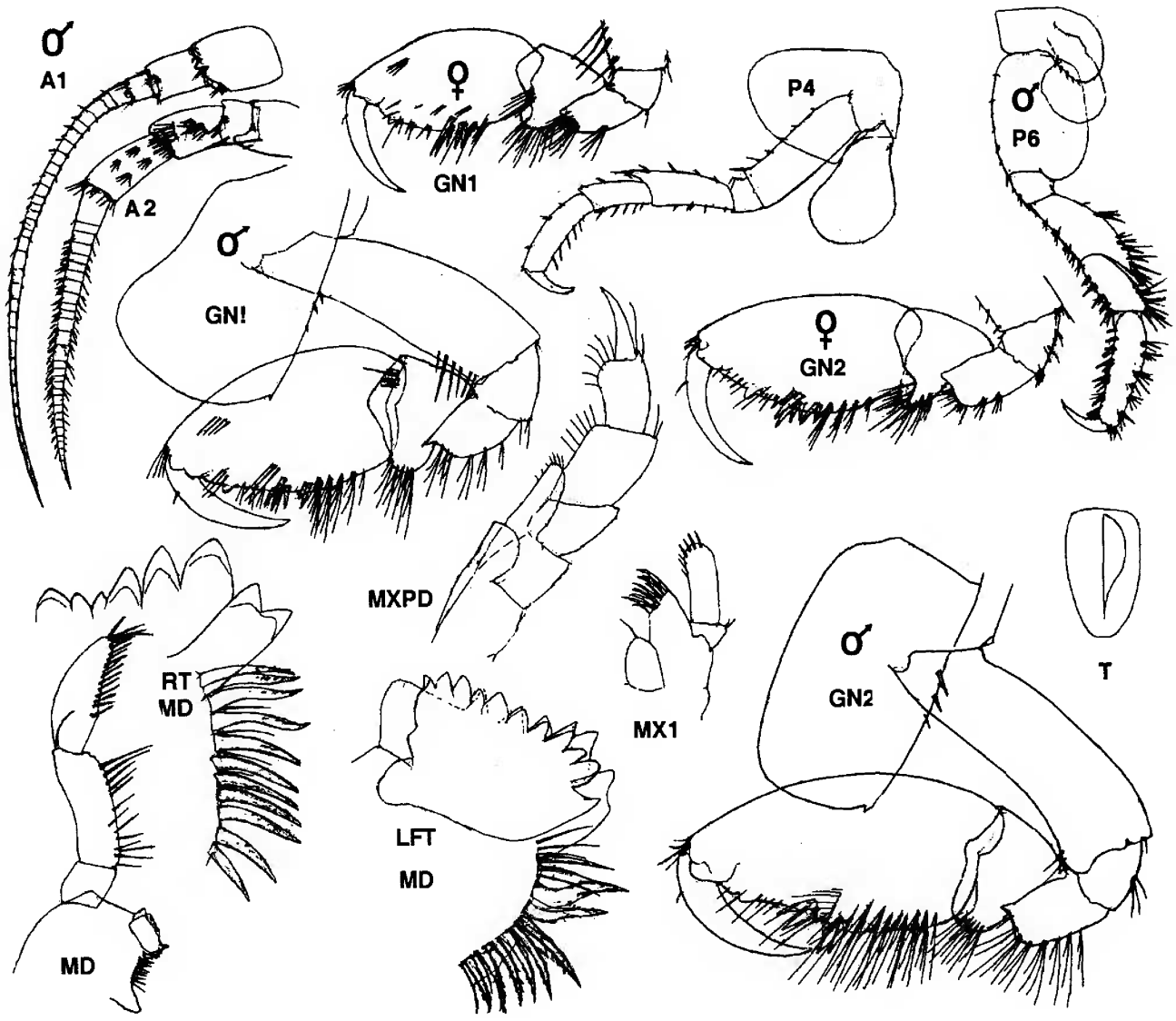

FIG. 16. ***Gnathopleustes simplex*****, n. sp. Male (6.8 mm); female ov (5.0 mm). Barkley Sound, B. C.**

WASHINGTON-OREGON.

Coastal Stations, ELB, July-August, 1966: W2 (4 + slide mount); W5 (2); W22 (9 + slide mounts); W24 (~300); + slide mounts); W34 (15) W45 (9); W50(~50); W53 (10); W57 (~25); W58 (~28); W61 (23); W63 (~70).

Eagle Cove, San Juan I., R. M. O'Clair Stn. 74001, June 21, 1974 - 2 females (slide mount).

Charleston, Ore., mouth of Coos Bay, floating dock below LW, among *Enteromorpha* and *Polysiphonia* sp., K. E. Conlan coll., July 8, 1986: Stn 07-1 - ~70 males, females, im; Stn. 08-23 - 3 females, 4 im.

Diagnosis. Male (6.8 mm): Body slender, coxal and pleonal plates medium deep. Head, eye relatively small, short-reniform. Antenna 1, peduncular segments each with posterior marginal clusters of long setae; segment 3 long, length ~2/3 segment 2; accessory flagellum cone-like, with strong apical seta; flagellum with 48 segments. Antenna 2 shorter than 1; peduncular segment 5 not shorter than 4, both with posterior and facial clusters of setae; flagellum relatively short, with ~40 short segments, brush-like posteriorly.

Upper lip tall, apical cleft shallow, lobes asymmetrical. Lower lip, inner lobes deep; outer lobes large, ovate, strongly oblique. Mandible, molar small apex subacute; spine row with 8-9 short thick blades, cutting edge of incisor with 7 regular teeth; palp segment 3 narrowing distally, inner margin with 18 pectinate "D" setae; left lacinia with 8-9-dentate. Maxilla 1, palp slightly narrowing distally, with 5 apical spines. Maxilla 2, outer plate narrowing distally apex relatively sparsely setose; inner plate with stout median marginal setae. Maxilliped, inner plate broad, with 7 distal facial setae and 5 apical marginal spinules; outer plate tall, columnar, apex rounded; palp segment 3 large stout, palp slender curved.

Coxal plates 1-3 each with single posterior marginal spine. Gnathopod 1, carpus shorter, deeper than long; propod ovate, narrowing distally, palm nearly horizontal with distinct median tooth, and dense clusters of long thick

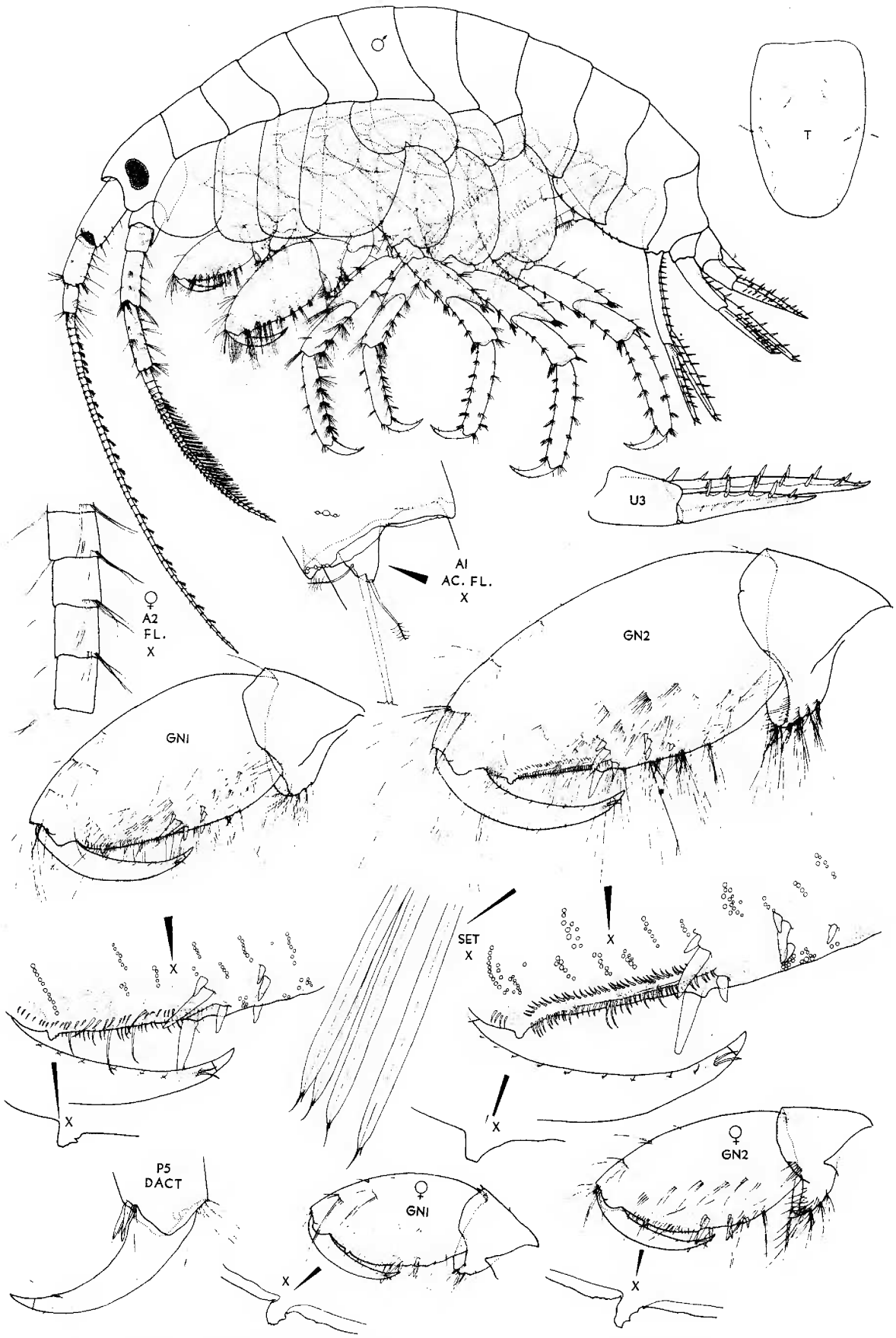

Fig. 17. ***Gnathopleustes pachychaetus,*** **new species. Male (6.8 mm); female (5.8 mm). Mayne I., B. C.**

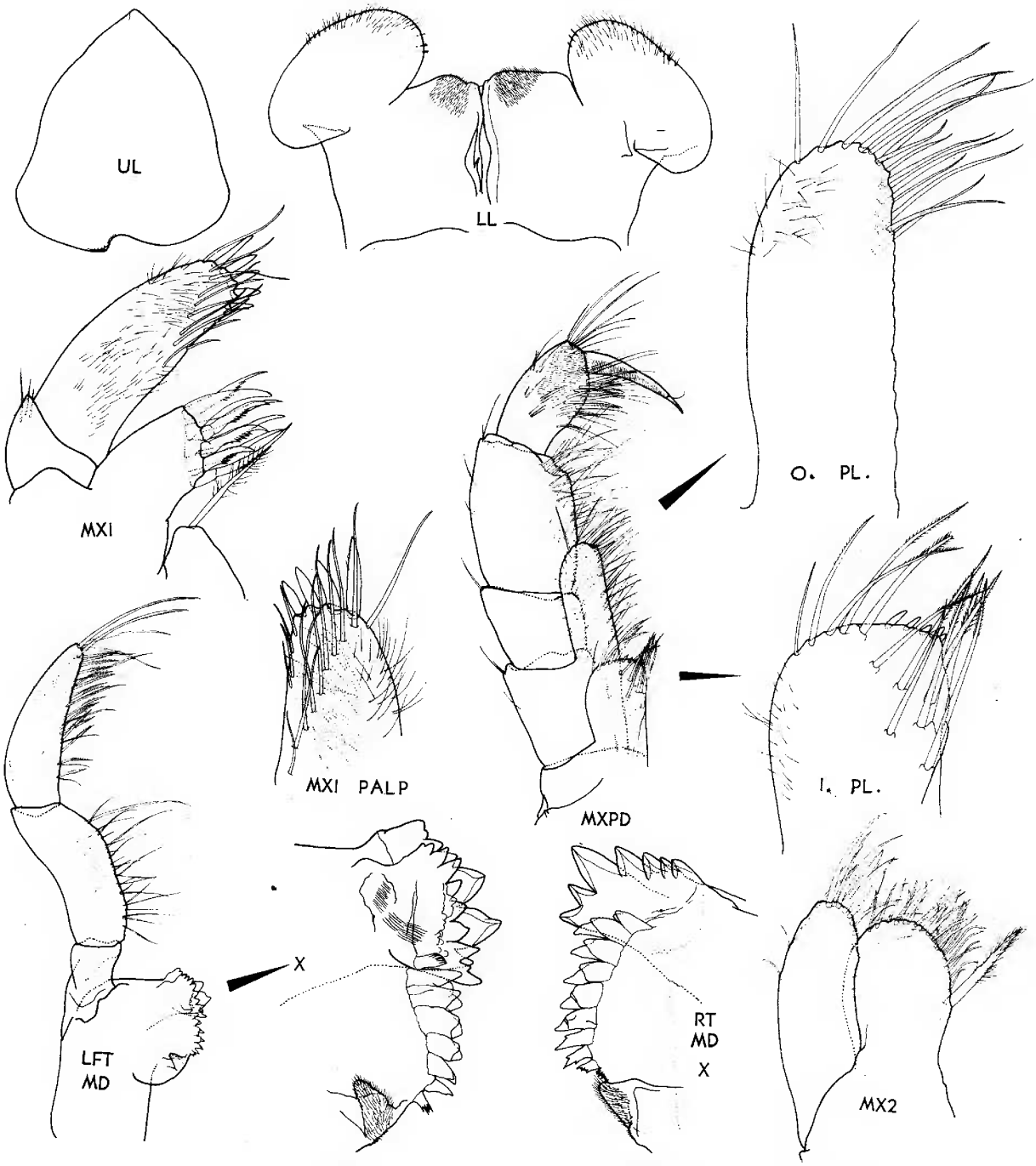

Fig. 18. ***Gnathopleustes pachychaetus,*** **new species. Male (6.8 mm). Mayne I., B. C.**

marginal "balloon" setae, margin merging smoothly with posterior margin, spine group at postero-distal angle with 4 spines, outermost largest, posterior margin with single distal cluster of 3 spines; dactyl, hind margin with a few small setules. Gnathopod 2 very similar but slightly larger, carpal lobe slightly deeper; palmar margin relatively short, distally slightly concave, postero-distal angle, spine cluster with 4 spines, posterior margin distally with a single spine and single cluster of spines.

Peraeopods 3 & 4, segment 4-6 with dense clusters of spines and setae especially posteriorly; dactyls medium. Peraeopods 5-7 similar, bases slightly broadening distally, hind margins gently convex; segment 5 short, segment 6 long, margins spinose, not setose; dactyls medium.

Pleon plates 2 and 3, lower margins weakly spinose, hind corners acuminate, slightly produced. Urosome 2 occluded dorsally by segments 1 & 3. uropods 1 & 2 slender, slightly exceeding uropod 3. Uropod 2, outer ramus distinctly shorter than inner ramus. Uropod 3, inner ramus with 6 pairs of marginal spines, outer ramus relatively large, = 3/4 inner ramus, margins 5-spinose

Telson broadly linguiform, apex broadly rounded.

Distribution. From southeastern Alaska, commonly throughout B. C. coastal waters, to southern Oregon, under rocks and among algae at LW level to shallow subtidal.

Etymology. From the Greek root words "*pachy*", meaning thick, and "*chaitē*" meaning hair, in reference to the thick, broad, laminate setae comprising the setose armature of the gnathopods.

Taxonomic commentary. *Gnathopleustes pachychaetus* is somewhat similar to the more southerly species, *G. den,* in the strongly setose, weakly sexually dimorphic gnathopods, and in some mouthparts (e.g., mandibular blades). However, the gnathopod setae are more strongly thickened, and thick setae occur also on the distal segments of the peraeopods, especially in the male. The posterior margins of peduncular segments of antenna 1 have 6-8 clusters of strong setae, and the flagellum of antenna 2 is brush-like, whereas corresponding parts of *G. den* are bare.

Gnathopleustes trichodus, new species
(Fig. 19)

Material Examined.
BRITISH COLUMBIA.
Southern Vancouver I.: West of Amphitrite Point, N. A. Powell Stn 67-83, 22 m, Aug. 22, 1967 - male **Holotype** (slide mount) CMN Cat. no. NMCC1995-0083.

Diagnosis. Male (8. 5 mm): Body slender, coxal and pleonal plates medium deep. Head, eye broadly reniform, black. Antenna 1 shorter than antenna 2; peduncular segment 3 short, length< 1/3 segment 3; accessory flagellum conical, with 1 large apical setae; flagellum with 55 segments basally slightly short-setose. Antenna 2, peduncular segment 5 longer than 4, both with distal and facial clusters of setae; flagellum elongate, with ~50 segments, each with prominent distal whorl of short setae.

Upper lip, median notch shallow, lobes nearly symmetrical. Lower lip, inner lobes relatively shallow, outer lobes regularly ovate, oblique. Mandible, molar process prominent, apex subacute; spine row with 9 medium stout blades, tips obliquely acute; cutting edge of incisor with 6 irregular teeth; palp segment 3 slender, elongate, with 13 inner marginal pectinate "D" spines; left lacinia 9-10 dentate. Maxilla 1, palp slender, with 4 apical spines. Maxilla 2, outer plate distally narrowing, apex strongly setose. Maxilliped, inner plate short,, with 7 distal facial setae and 5 apical marginal short spines; outer plate short narrowing to subtruncate apex; palp segment 3, inner margin with pectinate setae, dactyl slender, nearly straight.

Coxal plates 1-3 relatively broad, each with 1-3 hind marginal short spines. coxa 4 very broad, width and depth subequal. Coxa 5 shallow. Gnathopod 1, carpus short, deeper than long, lobe narrow; propod, palmar margin straight or slightly concave, median tooth strong, postero-distal angle with 2 groups of spines; median face with numerous clusters of slender thickened setae, giving densely setose appearance to propod; dactyl strong, not serrated behind. Gnathopod 2, similar, larger, very heavily setose; palm of propod distinctly concave; dactyl stout, nearly smooth behind.

Peraeopods 3 & 4, stout, margins of segment 4-6 setose and spinose; dactyls strong, >1/3 length of segment 6. Peraeopods 5-7 subsimilar, bases regularly broadly ovate, smooth behind; segment 4-6 hind margins strongly setose and spinose; segment 4 relatively short; dactyls medium.

Pleon plate 3, lower margin weakly spinose, hind corner acuminate, slightly produced. Urosome 2 nearly occluded dorsally by segments 1 & 3. Uropods slender, elongate. Uropod 1, distal peduncular spine short. Uropod 2, outer ramus slightly shorter than inner ramus. Uropod 3 inner ramus slender, margins with 8 pairs of spines; inner ramus relatively long, with 5-6 pairs of marginal spines.

Telson linguiform, medium long, apex broadly rounded.

Distribution. Known only from the type locality near Amphitrite Pt., outer coast of southern Vancouver Island.

Etymology. From the Greek "*trichos*" mean hair, alluding to the dense setation of the gnathopods and peraeopods.

Taxonomic commentary. *Gnathopleustes trichodus* is a primtive species, phyletically isolate from others of the group, especially in the form of the mouthparts, relative lengths of the antennae, broad coxal plates, concave gnathopod palms and densely setose peraeopods.

Gnathopleustes serratus, new species
(Figs. 20, 21)

Parapleustes pugettensis Shoemaker, 1964: 410, fig. 10.

Material Examined. About 40 specimens in 15 lots:
ALASKA. Southeastern Alaska. ELB Stns, 1961: A75 (Kayak, Wingham I.), LW, under boulders, June 27 - 5 males 3 females.

BRITISH COLUMBIA.
Queen Charlotte Island. ELB Stns, 1957: W12a(3); H11(1); Stn H14a, Yakan Pt., Graham I., under boulders at LW, Aug. 25 - male (8.7 mm), **Holotype** (slide mount) CMN Cat. no NMCC1995-0068; female ov. (10.0 mm) **Allotype** (slide mount), CMN Cat. no. NMCC1995-0069; plus 10 males, 9 females, 1 im., **Paratypes**, CMN Cat. no. NMCC1995-0070.
Northern Vancouver I.: ELB Stns N1 (Open Bight, Rivers Inlet)(5); V5 (Nigei I.,) (2).
Southern Vancouver I.: ELB Stn. O15 (Box I, north end Wickaninnish Bay) (20); ELB Stn P719 (Cape Beale), 1970 - 1 male, 1 im. ELB Stn. B3 (Diana I., Trevor Channel), 1976 - 1 female. ELB Stn B6a (Trial I. Point, Victoria), 1977 - 4 specimens

WASHINGTON-OREGON.
ELB Stns, 1966: W 40 (4); W57 (2); W58 (4); W61 (1); W63 (Cape Kiwanda) (>100).

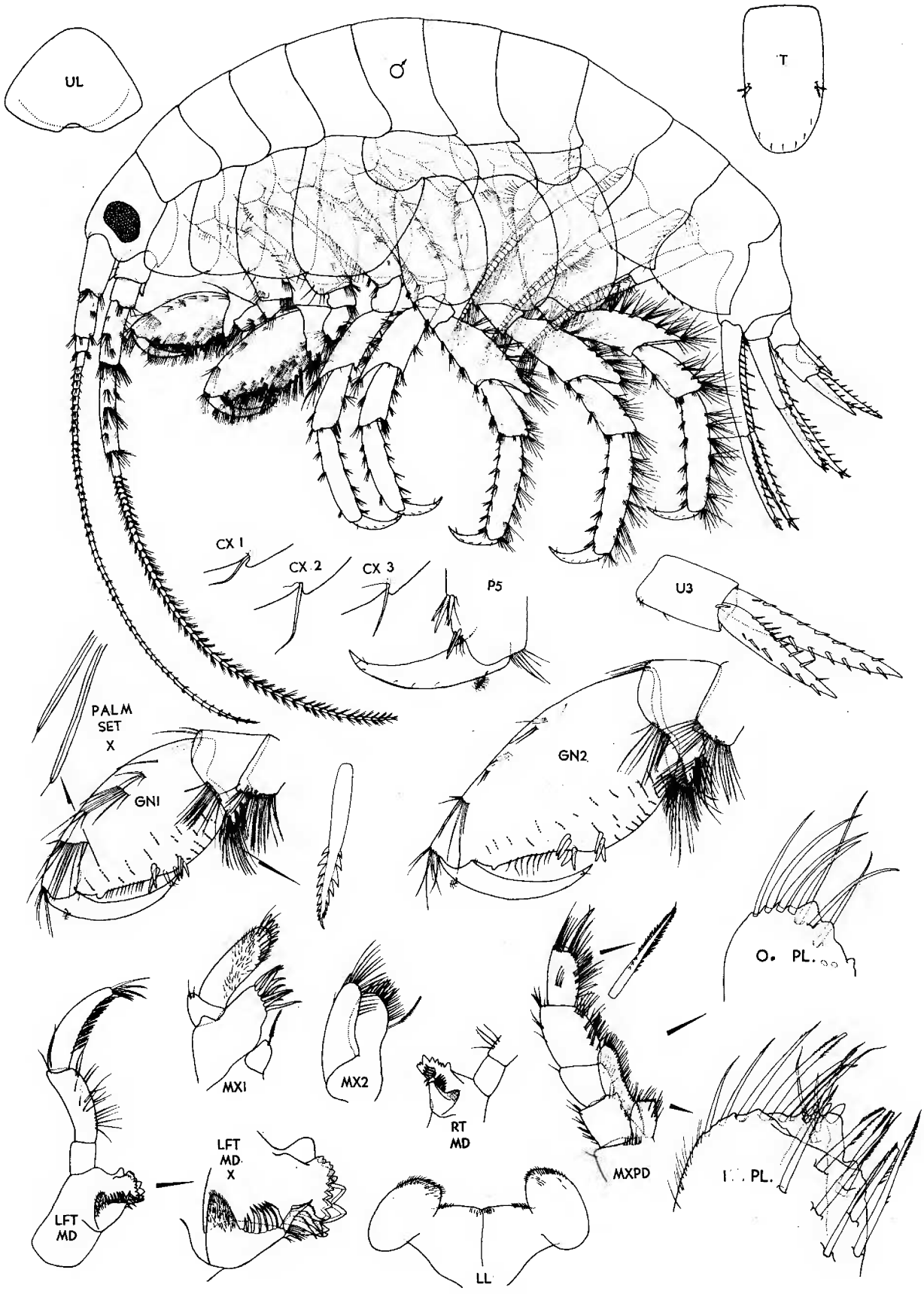

FIG. 19. ***Gnathopleustes trichodus,*** **new species. Male (8.5 mm). West of Amphitrite Pt., V. I., B. C.**

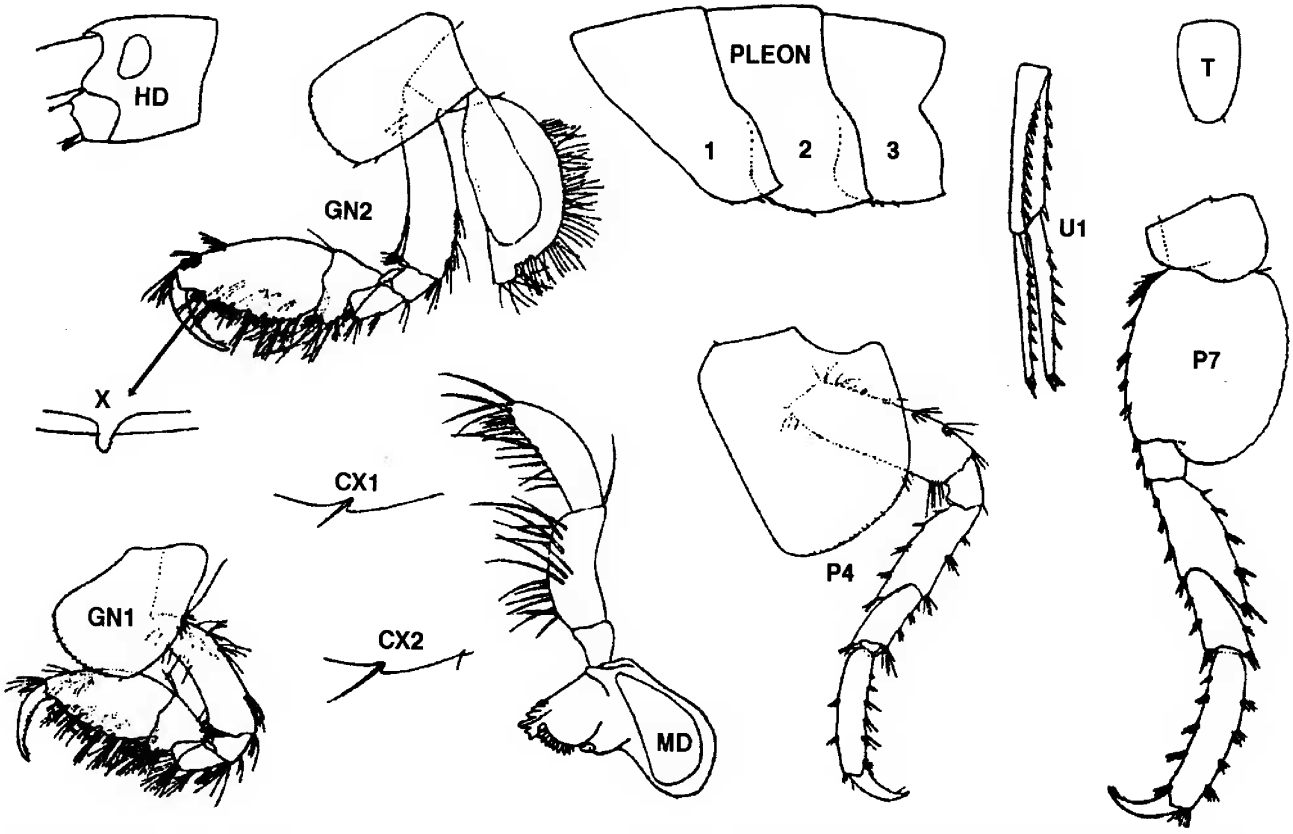

FIG. 20. ***Gnathopleustes serratus*** **n. sp. Female (9.0 mm). Dillon Beach, CA. (after Shoemaker, 1964).**

CALIFORNIA.

Albion Cove, at Cone Rock, Mendocino Co., Tony Chess coll., June 29, 1978 - 1 male.

Diagnosis. Male (8.7 mm): Body relative slender, coxal plates shallow. Head, eye large, subrhomboidal. Antenna 1, peduncular segment 3 medium; flagellum with ~45 short segments; accessory flagellum, truncate apex with 2 longish setae. Antenna 2, peduncular segment 5 not shorter than 4.; flagellum with ~25 segments, thickest proximally, each with distal ring of short "bottle-brush" setae.

Upper lip lobes distinctly asymmetrical. Lower lip, inner lobes deep, outer lobes short-ovate. Mandible, molar prominent, apex blunt; spine row with 8-10 thick, apically acute blades; incisor, cutting edge with 6 uneven teeth; left lacinia 8-dentate; palp segment 3 with 11-12 pectinate inner marginal "D" spines. Maxilla 1, palp stout, with 6 apical spines. Maxilla 2, outer plate not narrowing distally, apex strongly setose. Maxilliped, inner plate with 10 apical facial setae and 3 short apical spines; outer plate tall, distally narrowing; palp, dactyl slender, nearly straight.

Coxae 1 & 2, hind margin with 1-2 median short spines; coxa 4 shallow, broad. Gnathopod 1, carpus shorter than deep, hind lobe narrow; propod ovate, palm very oblique, gently convex, postero-distal angle with groups of 3 & 4 spines; dactyl strongly denticulate or serrated along proximal 2/3 of inner margin. Gnathopod 2, carpus short, hind lobe smaller than in gnathopod 1; propod long-ovate, very oblique palm merging smoothly with hind margin, not heavily marginally setose; postero-distal angle with 2 groups of 4 spines; dactyl serrated behind.

Peraeopods 3 & 4, segments regularly spinose; segments 5 , hind margin with 5 clusters of short spines; dactyls short. Peraeopods 5-7 closely homopodous, 5 slightly shortest; bases broadly expanded, hind margin strongly convex, minutely serrulate; segment 5 distinctly shorter than 4; dactyls short.

Pleon plate 3, hind corner acuminate. Urosome 2 nearly totally occluded dorsally by segment 1 & 3. Uropod 2, outer ramus 2/3 length of inner ramus. Uropod 3, inner ramus with 5 serially paired marginal spines. Telson linguiform, relatively narrow, length nearly twice width, apex sharply rounded.

Distribution. From southeastern Alaska to central California (Dillon Beach), mostly under boulders, associated with sessile invertebrates, *Egregia, Corallina* and other algae, at LW level.

Etymology. From the Latin "*serratus*", with reference to the serrated hind margins of the gnathopod dactyls.

Taxonomic commentary. *Gnathopleustes serratus* is relatively primitive species in characters of the mouthparts (maxilliped) and gnathopods (serrated dactyls), and near the base of the genus phyletically.

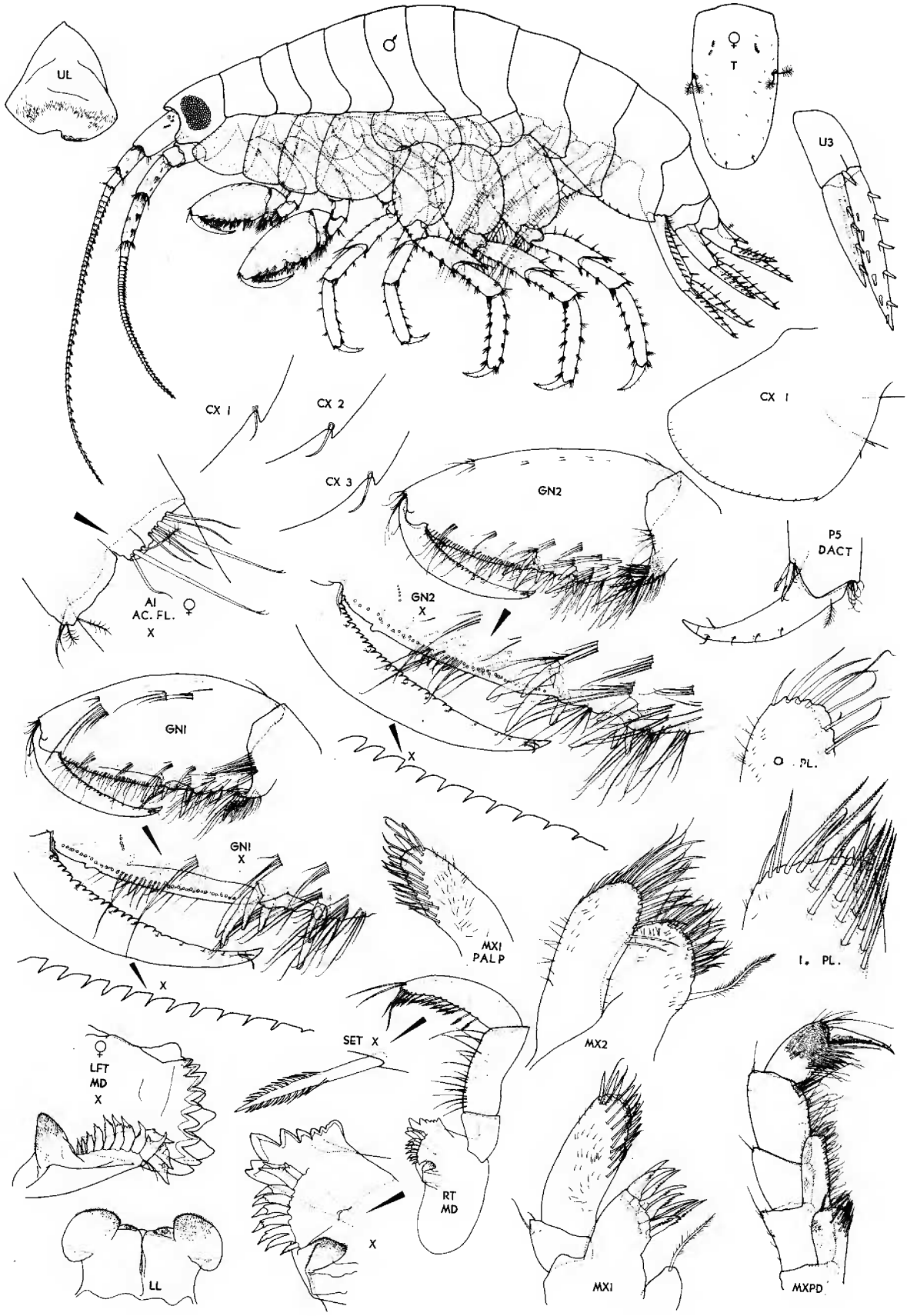

FIG. 21. ***Gnathopleustes serratus*****, new species. Male (8. 5 mm); female (10.0 mm). Graham I., B. C.**

Incisocalliope J. L. Barnard

Incisocalliope J. L. Barnard, 1959: 22.
Parapleustes Gurjanova,1951: 645 (part.).—Barnard & Given, 1960: 42 (part.).—Gurjanova, 1972: 131 (part.).—Watling & Maurer, 1973: 1 (part).—Barnard & Karaman, 1991: 649 (part).—Ishimaru, 1994: 46 (part).
Parapleustes (*derzhavini* group) Ishimaru, 1984: 407, 450.

Type species. *Incisocalliope newportensis* Barnard, 1959, original designation.

Species composition. *Incisocalliope dilatatus* (Ishimaru, 1984); *I. bairdi* (Boeck, 1871); *I. derzhavini* (Gurjanova, 1938); *I. nipponensis,* new species; *I. makiki* (J. L. Barnard, 1970); *I. aestuarius* (Watling & Maurer, 1973); *I. filiaris* (Hirayama, 1988).

Diagnosis. Body small to medium, slender, smooth above. Head, rostrum short, little exceeding rounded anterior head lobe. Eye small, medium rounded to ovate. Antennal flagella slender, nearly bare; antenna 1 longer than antenna 2. Antenna 1, peduncular segments 2 & 3 short, peduncle 1 lacking postero-distal cusp; accessory flagellum minute, triangular.

Mouthparts modified. Upper lip, median notch deep, lobes asymmetrical. Lower lip broad, squat, outer lobes steeply oblique. Mandible, molar reduced to a small setulose knob; left lacinia 9-12 dentate; blades numerous (9-14), unmodified; incisors 8-dentate; palp segment 2 medially sparsely setose, segment 3 longest, apically truncate, segment 1 medium. Maxilla 1, inner plate with 1 apical seta; outer plate with 9 medium strong pectinate spine-teeth; palp not broadened, surface setulose, apex rounded, with few spines, segment 1 with lateral seta(e). Maxilla 2, inner plate little broadened, inner margin with single large plumose seta. Maxilliped, inner plate with few (2-4) "button" spines; segment 3 longer than palp segment 2; outer plate columnar, palp segment 3 largest, segment 3 often with short inner distal spine-teeth; dactyl slender.

Coxal plates 1-4 medium deep; coxa 4 largest & strongly excavate behind; coxa 1 shortest, slightly expanding distally; hind cusps small, single or double. Gnathopods 1 & 2, variously (mainly strongly) subchelate, subequal, not sexually dimorphic. Gnathopod 1, basis normal, anterior margin often strongly setose; meral process weak; carpus short, deep; propod, palm convex, with median tooth, not continuous with weakly setose posterior margin; postero-distal angle with 2-3 spine groups not extending onto palm.

Peraeopods of medium length and stoutness, segments spinose but not setose; segment 4 slightly longer than and distally overhanging segment 5; dactyls medium, curved. Peraeopods 5-7 homopodous, increasing slightly posteriorly; coxae medium deep, rounded behind; bases broad, hind margin nearly flat.

Pleon segments normal, hind corners acuminate (but not hooked), lower margins lightly spinose. Pleopods normal, not sexually dimorphic, rami medium strong. Uropods 1 & 2 extending to or beyond uropod 3, rami spinose. Uropod 1, inner ramus slightly the longer. Uropod 2, outer ramus distinctly the shorter. Uropod 3, rami relatively short, inner ramus distinctly the longer.

Telson medium long, keeled proximally below, apex rounded, with small paired notch and seta.

Coxal gills undescribed. Brood plates large, broad.

Taxonomic remarks. *Incisocalliope* is phyletically the most advanced genus, with closest relationships to *Gnathopleustes* and, to some extent, to *Trachypleustes*. These groups may be distinguished by a combination of character trends, as outline in the key and Table I. (p. 128).

Distributional ecology. Species of *Incisocalliope* occur mainly in temperate or subtropical regions of pan-Pacific and North Atlantic regions, in shallow occasionally estuarine habitats. By contrast, the slightly less phyletically advanced members of *Gnathopleustes* are confined to open coast habitats of the North American Pacific region, but some (e.g., *G. pachychaetus*) exhibit brackish-water tolerance.

Incisocalliope newportensis Barnard
(Fig. 22)

Incisocalliope newportensis Barnard, 1959: 22, pl. 2.
Parapleustes pugettensis Barnard & Given, 1960: 43, fig. 4.—Barnard, 1969b: 178.—Barnard & Karaman, 1991: 650.

Material examined. J. L. Barnard's type specimen (Stn. #9, AHF- # 522) has been made available for this study, courtesy of the Los Angeles County Museum.

Diagnosis. Female (5.0 mm): Head, eyes medium, oval, black. Antennae especially peduncles, stout. Antenna 1 the longer; peduncular segment 1 large, 2 & 3 short; flagellum long. Antenna 2, peduncular segment 5 > segment 4.

Mandible, spine row with 8-9 blades; left lacinia 8-9 dentate; palp segment 3 with 6-7 posterior marginal pectinate "D" spines. Maxilla 1, palp segment 2, surface setulose, segment 1 with single "shoulder" seta. Maxillas 2, inner plate broad, short. Maxilliped, inner plate with button spines.

Coxal plate 1 large, expanding distally, little shorter than 2, with single postero-distal cusp. Coxa broad, width = depth. Gnathopods strongly subchelate, propods medium large; basis, anterior margin with a few scattered short setae; hind margin with a few setae proximally. Gnathopod 2, basis, anterior margin nearly bare.

Peraeopods 3 & 4, segment 5 short, length < segment 5; Peraeopods 5-7, bases broad, convex behind; segment 5 short dactyls strong.

Pleon plate 3, hind corner acuminate, hind margin nearly straight. Uropod 1, peduncle, outer margin strongly spinose.

KEY TO SPECIES OF *INCISOCALLIOPE*

1. Coxa 1 distinctly shorter than coxa 2; gnathopod 1, basis, anterior margin strongly setose (20+ setae); peraeopods 3 & 4, basis, anterior margin lined with short setae throughout ..... 2.
—Coxa 1 about as deep as coxa 2; gnathopod 1, basis, anterior margin nearly bare or with fewer than 15 setae; peraeopods 3 & 4 basis, anterior margin weakly setose ..... 3.

2. Uropod 2, rami subequal; peraeopod 7, basis medium broad, postero-distal lobe ordinary, not reaching to segment 4; dactyls short, < 1/3 segment 6 ..... *I. aestuarius* (p. 104)
—Uropod 2, outer ramus distinctly (1/3) the shorter; peraeopod 7, basis narrow, hind lobe deep, reaching segment 4 behind; dactyls heavy, strong, >1/3 segment 6 ..... *I. filialis* (p. 102)

3. Gnathopods 1 & 2, propods relatively weak, depth not greater than carpus; gnathopod 1, basis with antero-distal cluster of 3 long setae ..... 4.
—Gnathopods 1 & 2, propods relatively stout, strong, depth greater than carpus; gnathopod 1, basis antero-distally with 0-2, or 4, long setae ..... 5.

4. Gnathopod 2, basis with 2 strong antero-distal setae; antenna 1, peduncular segment 1 large, distinctly longer than segments 2 & 3 combined ..... *I. derzhavini* (p. 102)
—Gnathopod 2, basis lacking strong antero-distal setae; antenna 1, peduncle 1 ordinary, length about equal to segments 2 & 3 combined ..... *I. nipponensis* (p. 100)

5. Gnathopod 1, basis, anterior marginal setae long, length > width of basis; antenna 2, peduncular segment 5 not longer than 4 ..... *I. makiki* (p. 98)
Gnathopod 1, basis, anterior marginal setae short, length < width of basis; antenna 2, peduncular segment 5, length distinctly > segment 4 ..... 6.

6. Peraeopods 3 & 4, segment 5 regular, length ~ segment 4; antenna 2, peduncular segments 4 & 5 slender, length 3-4 X width ..... *I. bairdi* (p. 96)
—Peraeopods 3 & 4, segment 5 short, thick, length < segment 4; antenna 2, peduncular segments 4 & 5 relatively short, thick, length ~2X width ..... 7.

7. Peraeopod 4, coxa broad, width ~depth; uropod 1, peduncular outer margin lined with 10-12 strong spines; uropod 3, inner ramus with 5-6 pairs of marginal spines . . *I. newportensis* (p. 95)
—Peraeopod 4, basis narrow, width < depth; uropod 1, peduncular margin proximally with cluster of 3-4 stout spines; uropod 3, inner ramus, margins with 3-4 pairs of spines. *I. dilatatus* (p. 97)

Uropod 2, outer ramus ~3/4 inner ramus. Uropod 3, inner ramus with 6 pairs of marginal spines. Telson long, apex truncated.

Taxonomic and distributional commentary. The type locality of *Incisocalliope newportensis* is Newport Bay, California. The species has been recorded authentically on the eastern Pacific coast only south of Pt. Conception. It has been confused with *Gnathopleustes pugettensis*. However, morphological differences are major, and the latter is also larger at maturity and more northerly in distribution.

Incisocalliope newportensis and *I. bairdi* (J. L. Barnard) form a primitive species pair within the genus. Further species of the genus may yet be discovered, especially in the Baja and Gulf of California regions, and in the southern Sea of Japan and China Sea regions. Differences noted here between this pair and the remaining six species may eventually form a basis for recognition of the two phyletic groups at the subgeneric level (Fig. 43, p. 127).

Incisocalliope bairdi (Boeck)
(Fig. 23)

Paramphitoe bairdi Boeck, 1871: 45-46, 50, pl. 1, fig. 3.—Barnard, 1956: 36, Plate 12.—Barnard & Karaman, 1991: 650.
Neopleustes bairdi Stebbing, 1906: 314-315.
non *Parapleustes pugettensis* Barnard & Given, 1960.

Diagnosis. Male (5.5 mm): Head, eyes medium large, oval-round, black. Antenna 1 the longer, flagellum 36-segmented. Antenna 2, peduncular segment 4 & 5 slender, segment 5> 4.

Mandible, spine row with 15 blades; lacinia with 9 teeth; palp segment 3 with 9-10 posterior marginal "D" spines. Maxilla 1, palp segment 2, apex with 7 spines and facial setal row, segment 1 with 2 short "shoulder " setae. Maxilla 2, plates small, inner plate not broadened. Maxilliped, inner plate with 4-5 apical marginal "button" spines outer plate columnar; palp segment 3 large, heavy.

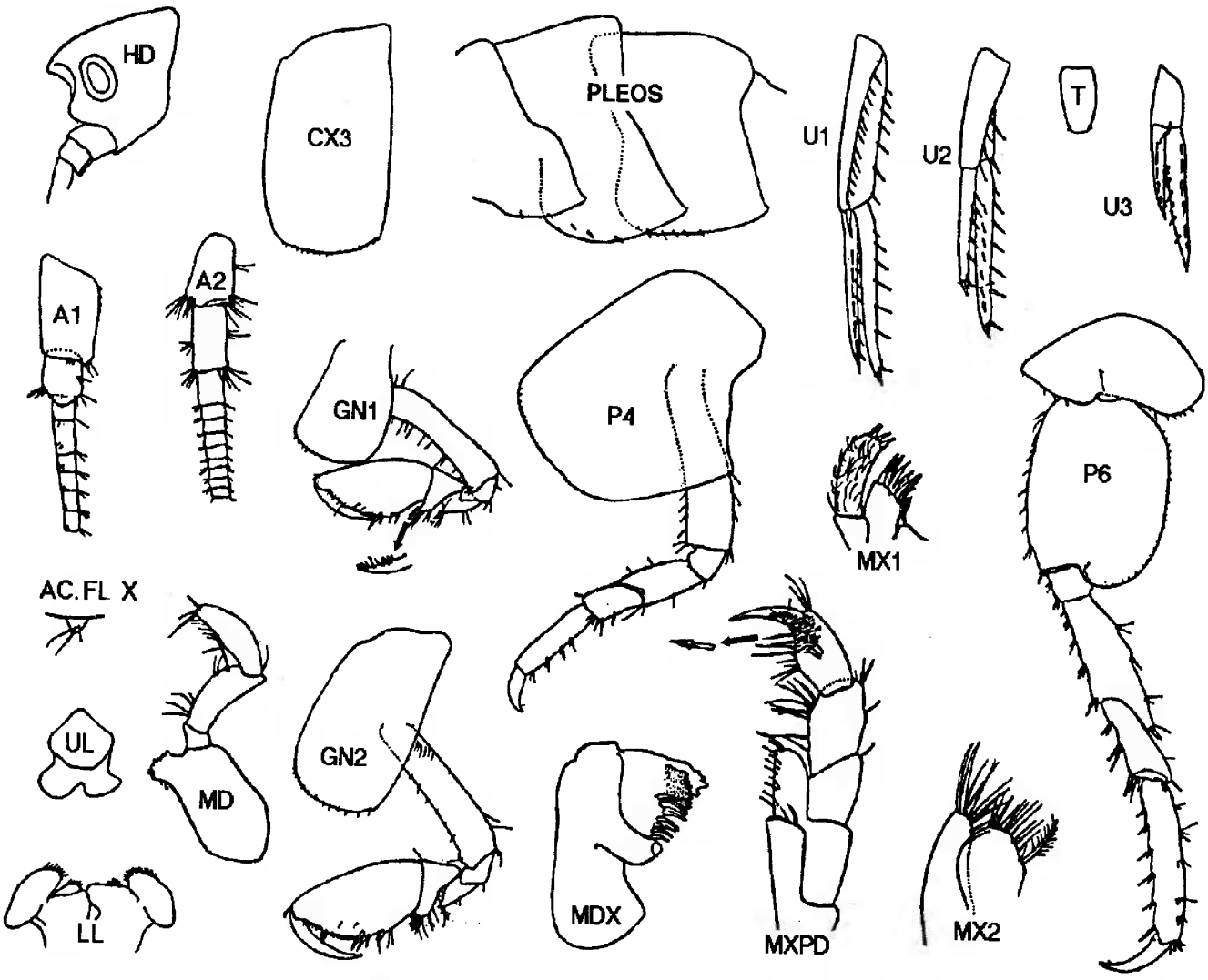

FIG. 22. ***Incisocalliope newportensis*** **(Barnard 1959). Female (5.0 mm). New port Bay, California.**

Coxal 1 large, broadening distally, lower margin gently convex, with single postero-distal cusp. Coxa 4 narrow, width < depth. Gnathopods large, strongly subchelate. Gnathopod 1, basis, anterior and posterior margins nearly smooth; merus with short distal process; propod, hind margin straight, with single distal setal group. Gnathopod 2, hind margin of coxa with 2-3 short spines; basis nearly bare of setae.

Peraeopods 3 & 4, segment 5 not shortened, length ~= segment 4. Peraeopods 5-7, bases medium broad, hind margins nearly straight; segment 5 not shortened. Dactyls medium.

Pleon 3, hind corner acuminate, Uropod 1, peduncular outer margin with 7-8 spines, outer ramus very slightly the shorter. Uropod 2, outer ramus about 3/4 length of inner ramus. Uropod 3, inner ramus with 5 pairs of marginal spines. Telson medium, narrowing to smoothly rounded apex.

Taxonomic commentary. The species was first described by Boeck (1872) from southern California, and rediscovered in fresh material from the same region by J. L. Barnard (1956). Barnard's description and figures, more detailed than the accounts of Boeck (loc. cit.) and Stebbing [a](1906) form the basis of the present analysis.

Incisocalliope dilatatus (Ishimaru)
(Fig. 24)

Parapleustes dilatatus Ishimaru, 1984: 425, figs. 17-20.—Barnard & Karaman, 1991: 650.—Ishimaru, 1994: 54.

Diagnosis. Male (4.7 mm): Head, eye medium large almond-shaped, black. Antennae relatively short, first slightly the longer. Antenna 1, peduncular segment 1 short, thick; flagellum 27-segmented. Antenna 2, peduncular segments 4 & 5 relatively long, slender, 5 > 4; flagellum 18-segmented.

Mandible, spine row with 10 blades; left lacinia 9-dentate; palp segment 3 with 6 posterior marginal "D" spines. Maxilla 1, palp segment 1 with 2 "shoulder" setae; segment 2, apex oblique, with 4 spines and numerous facial

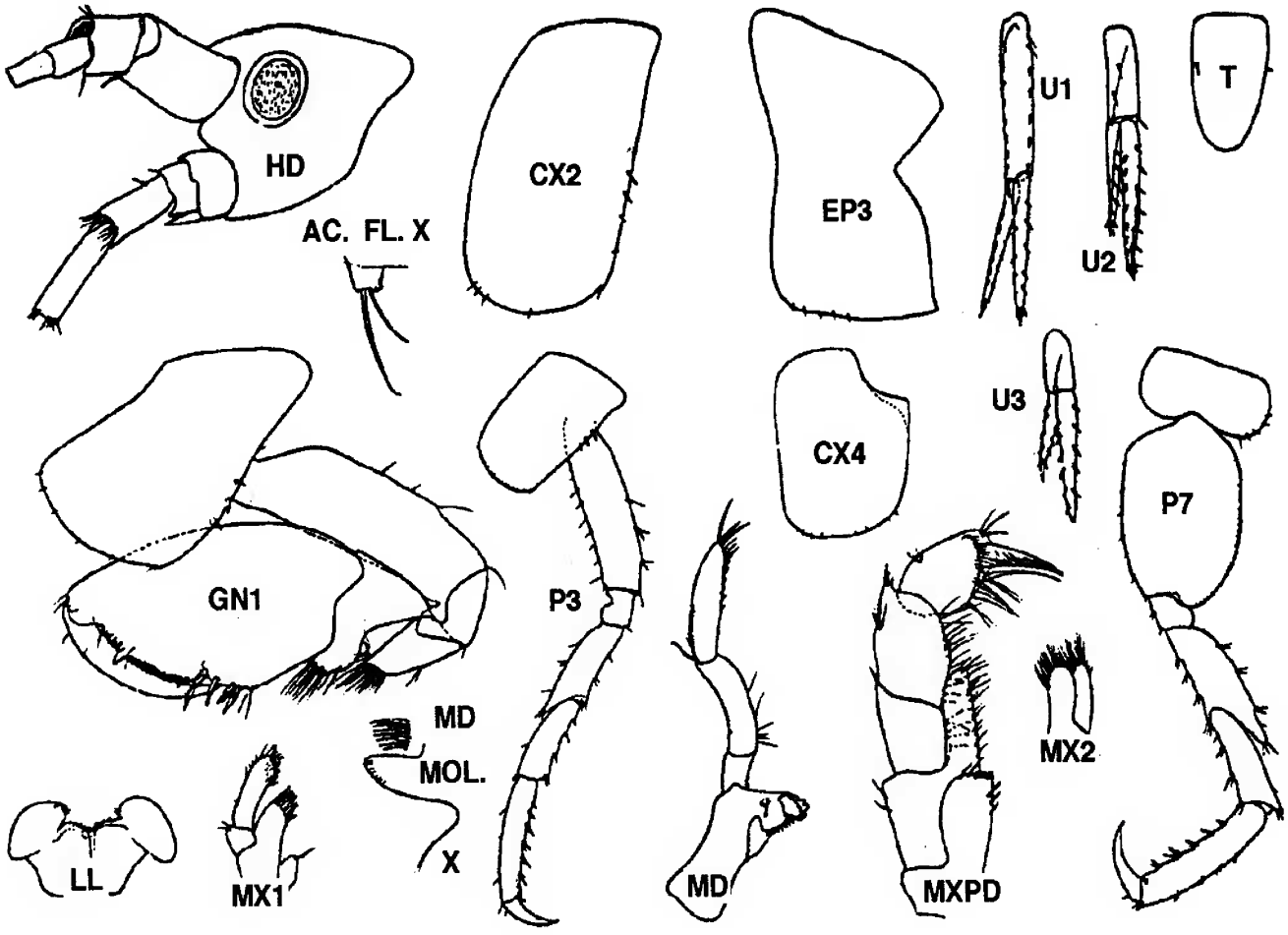

FIG. 23. Incisocalliope bairdi (Boeck, 1971). Male (5.5 mm). S. California. (after Barnard, 1956).

setae. Maxilla 2, inner plate very slightly broadened. Maxilliped, inner plate with 3 apical "button" spines; outer pate, with 2 slender apical spines; palp segment 3 with distal inner facial scales .

Coxal plate 1 large, distal margin convex, hind corner with 2 small cusps, posterior margin with 2 short spines. Coxa 4 medium, depth > width. Gnathopods strongly subchelate, propods relatively large. Gnathopod 1, basis with 1-2 stout anterior marginal setae, hind margin nearly bare; merus lacking postero-distal process; propod with superior medial facial cluster of setae; hind margin with single distal setal group. Gnathopod 2, anterior and posterior margins with weak, short setae; merus with strong postero-distal process.

Peraeopod 3 & 4, segment 4 short, length > segment 5, dactyl medium. Peraeopods 5-7, bases broad, rounded behind; segment 5 short, length < segment 4.

Pleon plate 3, hind corner acuminate. Uropod 1, peduncular outer margin relatively weakly spinose, with cluster of 3 strongest spines proximally; rami weakly marginally spinose; outer ramus distinctly the shorter. Uropod 2, peduncle with 2 strong outer marginal spines. Uropod 3, rami short, inner ramus with 3-4 marginal spines. Telson relatively short narrowly slightly to broadly rounded apex. Female (6.0 mm). No discernible difference from the male

Taxonomic commentary. *Incisocalliope dilatatus* is morphologically closest to *I. makiki* Barnard from the Hawaiian Islands (Fig. 44, p. 129). Both are members of the advanced subgroup that includes, *I. derzhavini* and *I. filialis* of the western Pacific region.

Distribution. Japan Sea, southern shores of Hokkaido, under marine algae, LW level. Females ov., May to August.

Incisocalliope makiki (J. L. Barnard)
(Fig. 25)

Parapleustes derzhavini makiki Barnard, 1970: 227.

Diagnosis. Female (4.2 mm): Head, eye medium large, reddish or dark brownish, irregularly roundish. Antenna 1, peduncular segment 1 large > 2 & 3 combined, flagellum 24+ segmented. Antenna 2, peduncular segment 4 & 5 medium stout, subequal, flagellum 18+ segmented.

Mandible, spine row with 8 blades, left lacinia 10-11-

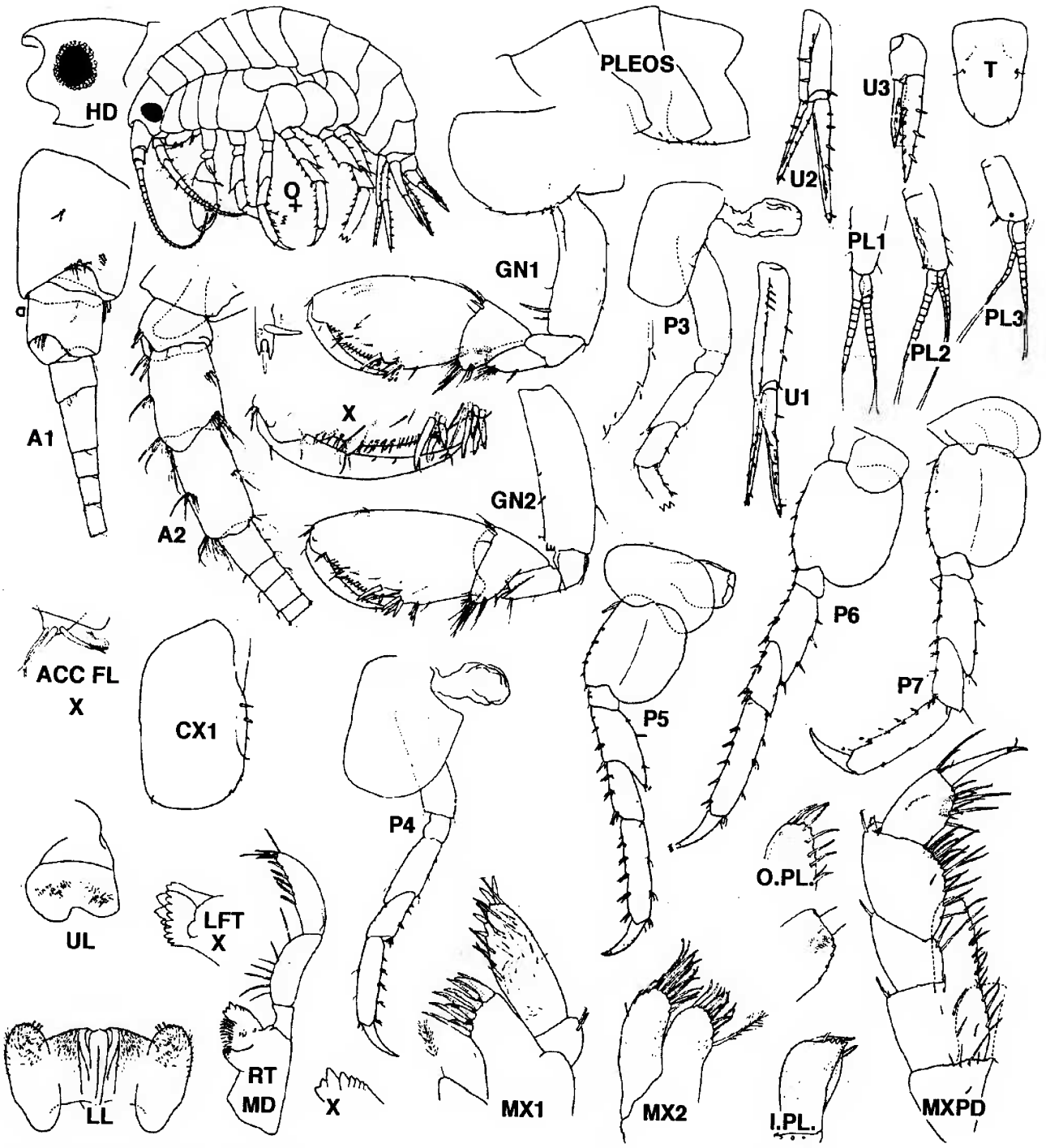

FIG. 24. ***Incisocalliope dilatatus*** **(Ishimaru, 1984). Male (4. 7 mm). Hokkaido. (after Ishimaru, 1984).**

dentate; palp segment 3, inner margin with 7 pectinate "D" setae. Maxilla 1, inner plate small, with 1 apical seta. Maxilliped, inner plate with 2 apical "button spines; outer plate with 2 slender apical spines; palp segment 3, with pectinations or scales at base of dactyl.

Coxa 1 medium large, lower margin convex, hind corner with 1-2 cusps, hind margin with single spine. Coxa 2 with 1 postero-distal cusp. Coxa 4 broad, as wide as deep. Gnathopods strongly subchelate; propod of gnathopod 2 larger than 1. Gnathopod 1, basis, anterior margin with numerous (~10) strong setae, each longer than width of basis, hind margin weakly setose proximally?; merus lacking distal process 1; propod with superior facial group of 2 setae; posterior margin bare. Gnathopod 2, basis virtually lacking marginal setae; merus with postero-distal process; propods, hind margin with distal group of spines and setae.

Peraeopods 3 & 4, basis, margins weakly short-setose; segment 5 slightly shorter than 4; segment 6, hind margin spinose. Peraeopods 5-7, basis moderately broad, hind margins convex, lower hind lobe shallow, not reaching

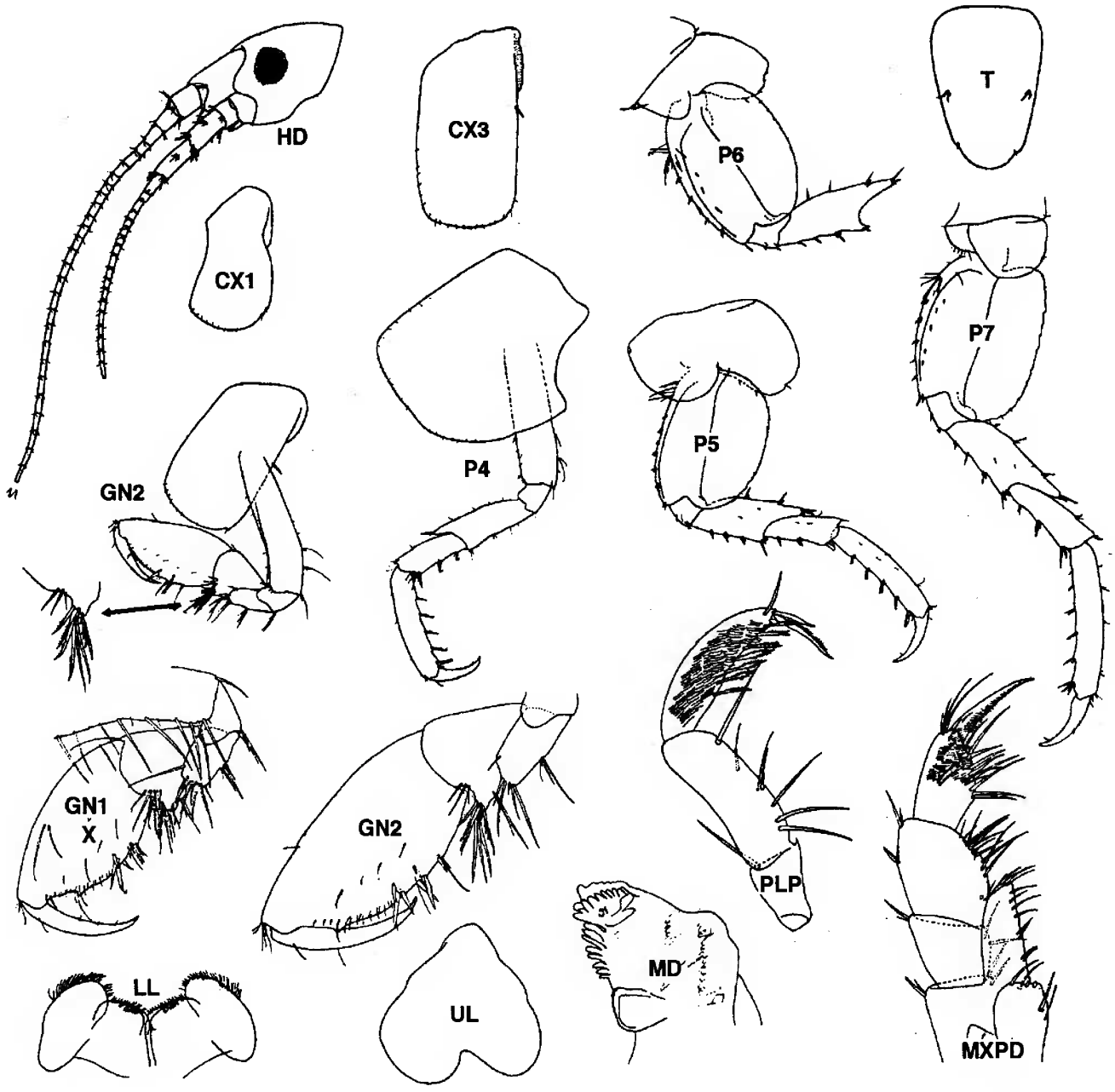

FIG. 25. ***Incisocalliope makiki*** **(J. L. Barnard). Female (4.2 mm). Hawaii (after Barnard, 1970).**

segment 4; segment 5 shorter than segment 4.

Pleon 3, hind corner minutely acuminate. Uropods 1 & 2 strong. Uropod 1, peduncle, outer margin strongly spinose; outer ramus distinctly the shorter. Uropod 3, inner ramus slender, margins with 6 spines. Telson short, broad, little longer than wide, normally rounding apically.

Distribution. Oahu, Hawaiian Islands; 3-4 m in depth.

Taxonomic commentary. *Incisocalliope makiki* merits full species status here. Its presumed common ancestor with *I. dilatatus* may have penetrated the Hawaiian archipelgo in the early Tertiary Period (p. 130).

Incisocalliope nipponensis, new species
(Fig. 26)

Parapleustes derzhavini Ishimaru, 1984: 417.--Ishimaru, 1994: 54 (part.)

Diagnosis. Female (5.0 mm): Head, eye small, rounded, black. Antenna 1, peduncular segments 1-3 short, segment 1 = 2 and 3 combined; flagellum, slender 25-segmented. Antenna 2, peduncular segment 4 shorter than 5, medium thick; flagellum slender, 24-segmented.

Mandible, spine row with 8 blades; left lacinia 11-dentate; palp segment 3 with 7 posterior marginal "D" setae.

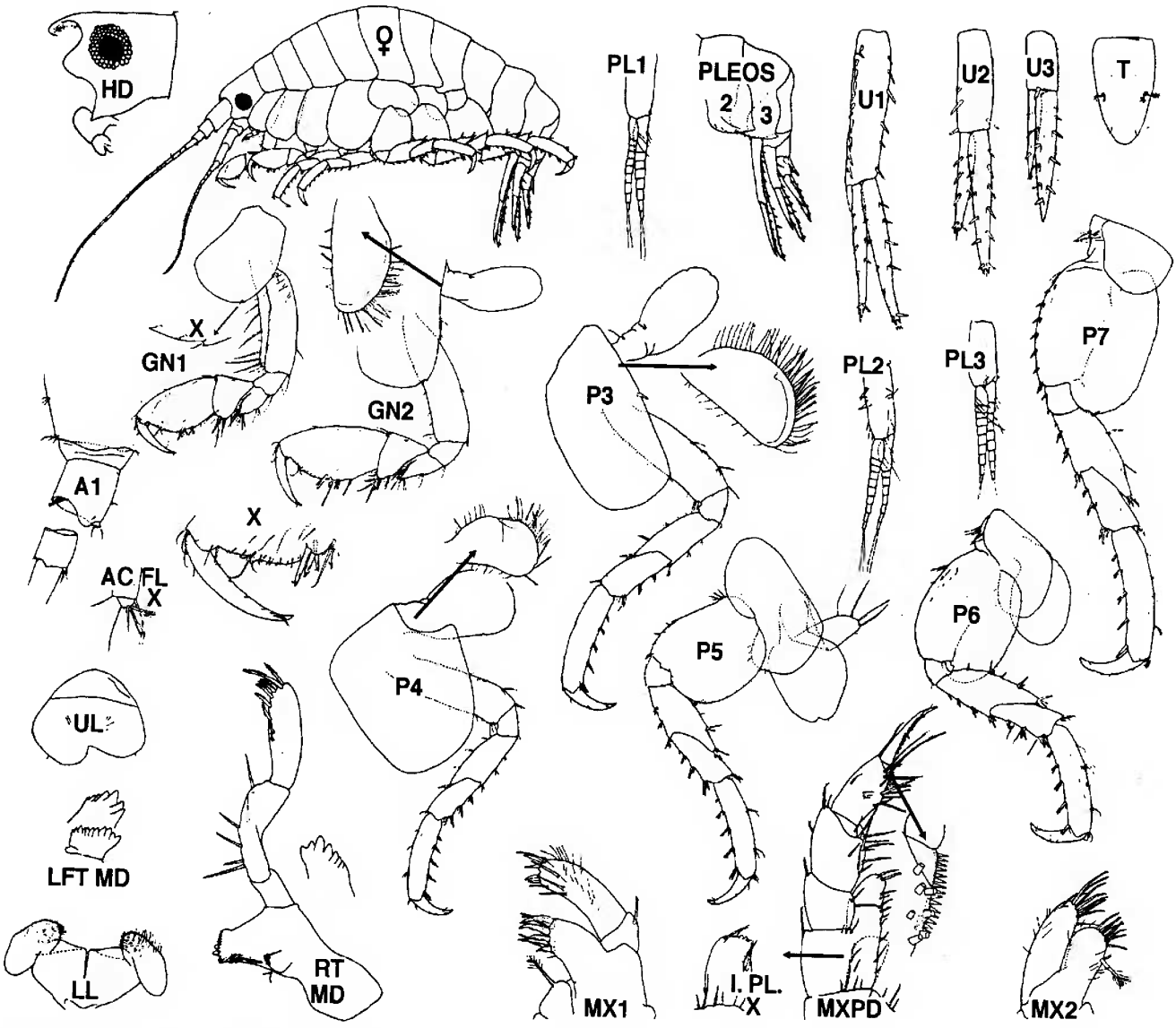

FIG. 26. ***Incisocalliope nipponensis*****, new species. Female (4.6 mm). Japan Sea. (after Ishimaru, 1984).**

Maxilla 1, palp segment 1 with single "shoulder" seta; segment 2 apically with 4 spines and facial row of 3 setae. Maxilla 2, inner plate short, not broadened. Maxilliped, inner plate with 3 "button" spines; outer plate with 2 apical slender spines; palp segment 3 with distal inner marginal pectinations.

Coxa 1 small, 1/3 shorter than 2, with single postero-distal cusp and 1-2 posterior marginal short spines. Coxa 4 medium broad, not as wide as deep. Gnathopods relatively weakly subchelate, propods only slightly broadened. Gnathopod 1, basis with 15+ long anterior marginal setae and ~10 short postero proximal marginal setae, merus with distal cusp; propod, hind margin with single distal spine. Gnathopod 2, basis, margins nearly bare merus with acute postero-distal cusp.

Peraeopods 3 & 4, regular, segment 5 not noticeably shortened, dactyls medium. Peraeopods 5-7, base broadly expanded, hind margins convex, dactyls stout.

Pleon plate 3, hind corner strongly acuminate. Uropod 1, peduncle, outer margin strongly spinose. Uropod 2, inner ramus longer than peduncles, 1/3 longer than outer ramus. Uropod 3, inner ramus 1/3 longer than outer ramus, with 4-5 pairs of marginal spines. Telson medium long, narrowing to sharply rounded apex.

Type material. Female "a" (5.0 mm) **Holotype**;. Stn. 4, Samani, au 5 1982.Hokkaido, (Sea of Japan coast); also 2 females. **Paratypes,** at stations 2-4 along south coast of Hokkaido, 0.5 m depth, among algae, Collections of the Zoological Museum, Faculty of Science, Hokkaido University.

Distribution. Shores of Hokkaido, LW to 5 m depth Sargassum belt, Laminaria belt; among *Leathesia* and other algae scraped from surface of boulders.

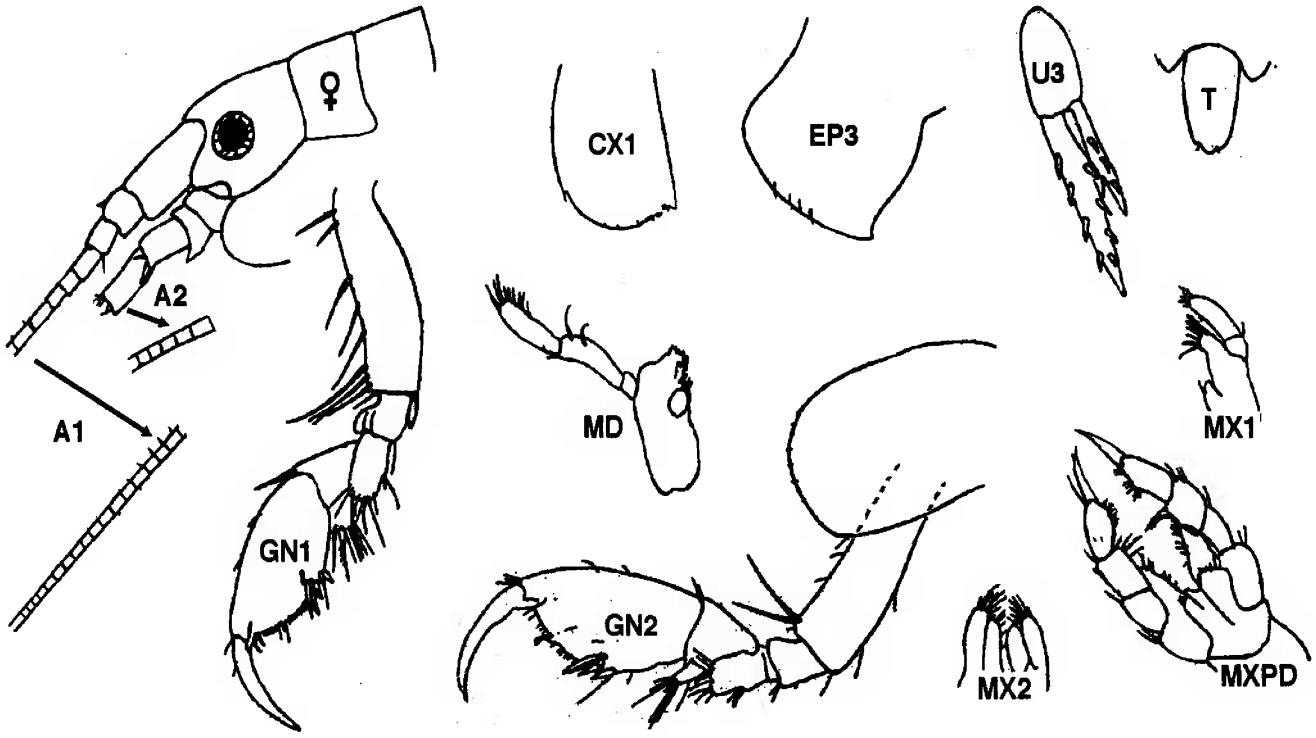

FIG. 27. *Incisocalliope derzhavini* (Gurj., 1938). Female (4.0 mm). Japan Sea. (after Gurjanova, 1951).

Taxonomic commentary. This description is based on the careful work of Ishimaru (1984). He had previously found it very similar to the female (4.0 mm) *of Neopleustes derzhavini* from the sea of Japan, described by Gurjanova (1951), that is treated below (see also Fig. 27).

Incisocalliope derzhavini Gurjanova
(Fig. 27)

Neopleustes derzhavini Gurjanova, 1938: 317, fig. 31. Gurjanova, 1951: 645, fig. 442.
Parapleustes derzhavini Barnard & Karaman, 1991: 650 (part)

Diagnosis. Female (4.0 mm): Head, eyes medium, round, black. Antenna 1, peduncle 1 large, length > segments 2 & 3 combined; flagellum medium long, slender, 25-27 segmented. Antenna 2, peduncular segment 4 & 5 short, thick, 5 > 4; flagellum 18- segmented.

Mandible, spine row with 6-8 blades; palp segment 3 with 5-6 pectinate "D" spines. Maxilla 1, palp segment 1 with 1 shoulder seta; segment 2, rounded apex with 4 spines. Maxilla 2, inner plate not broadened. Maxilliped, inner plate with 3 (?) button spines, palp segment 3 with pectinations at base of dactyl?

Coxa 1 relatively short, little broadening distally, lower margin convex, with 1 hind cusp. Gnathopods relatively weakly subchelate; propods not deeper than respective carpus. Gnathopod 1, basis, anterior margin with 9-10 stout setae, concentrated distally, mostly longer than width of basis; merus lacking distal process; propod hind margin bare. Gnathopod 2, basis, antero-distal margin with 2 very large stout setae, hind margin nearly bare; merus with short distal process?, propod, hind margin with single distal seta.

Peraeopods 3 & 4 ordinary. Peraeopods 5-7 ordinary; bases moderately expanded, ovate.

Pleon plate 3, hind corner acuminate, lower margin gently convex, with 4-5 small spines. Uropod 3, inner ramus slender, margins each with 4 spines. Telson medium long, narrow, sharply rounding at apex.

Distributional ecology. Japan Sea; tidal zone.

Taxonomic commentary. Gurjanova's original figures and description are limited but sufficiently detailed to separate *I. derzhavini* from the material of Ishimaru (loc. cit.) described above as *I. nipponensis,* new species.

Incisocalliope filialis (Hirayama)
(Fig. 28)

Parapleustes filialis Hirayama, 1988: 40, figs. 265-268.—Barnard & Karaman, 1991: 650.—Ishimaru, 1994: 54.

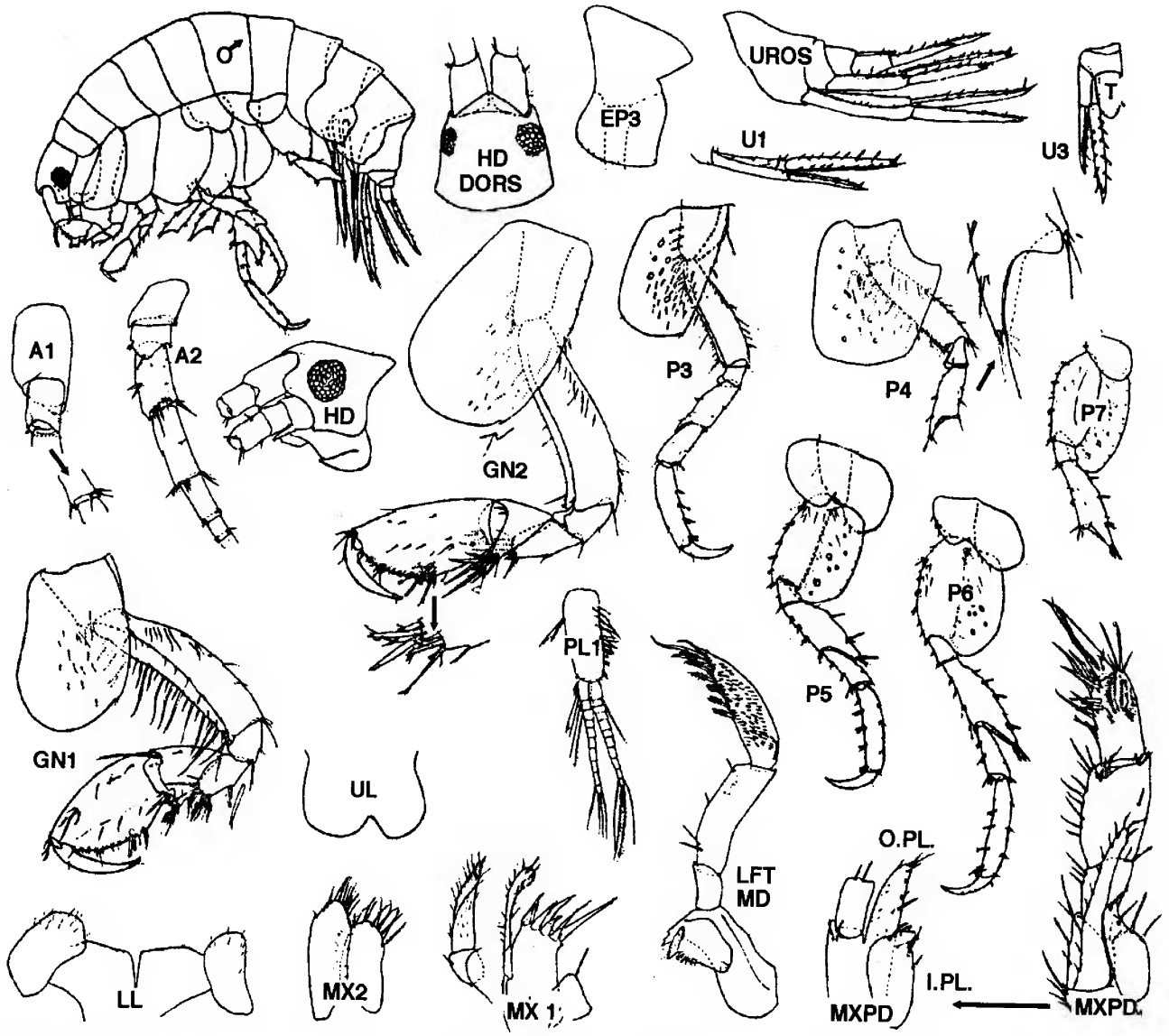

FIG. 28. *Incisocalliope filialiss* (Hirayama). Male (3.5 mm). Ariake Sea, Japan. (after Hirayama, 1988).

Diagnosis. Male (3.5 mm): Body small, pleonites slightly raised postero-dorsally. Head, eyes medium large, nearly round, black. Antennae slender, medium long. Antenna 1, peduncular segment 2 short, ~1/2 segment 1; flagellum ~15-segmented. Antenna 2, peduncular segments 4 & 5 stout, 5 slightly the longer; flagellum 16-segmented.

Upper lip with relatively deep V-notch, lobes asymmetrical. Lower lip inner lobes broad, outer lobes oblique. Mandible, molar process small, vestigial; spine row with 6 short blades; incisor (left) with 4 proximal large teeth and 4-5 distal denticles; palp segment 3, basal "A" seta small, inner margin with 5-6 pectinate "D" spines; left lacinia 10-dentate. Maxilla 1, inner plate with single apical seta; palp segment 1 with single "shoulder" seta; distal segment, apex with 4-5 slender spines. Maxilla 2, inner plate short, not broadened, inner margin with single proximal plumose seta. Maxilliped, inner plate medium, inner margin notched distally, apex with 5 slender spines; outer plate slender, truncate apex with 2 slender spines; palp stout, segment 3 with distal pectinate denticles at base of dactyl; dactyl slender, straight, length about equal to segment 3.

Coxal plates 1-3 lower margins broadly rounded, hind margins with 1-2 median short spines, hind corners each with single cusp. Coxa 1 distinctly shorter than 2. Gnathopod 1, anterior margin of basis strongly setose, (20+ setae), some setae longer than width of basis; hind margin of basis proximally with 6-8 shorter setae.; carpus short, as deep as long, hind lobe stout; propod short, expanding distally, inner face with scattered setae; palmar margin convex, oblique slightly longer than hind margin, postero-distal angle with spine groups on either side of short dactyl-tip depression, distal spines larger; dactyl slender, with small distal unguis. Gnathopod 2, anterior margin of basis weakly setose, with single distal seta; hind margin proximally with row of setae; carpus short, hind lobe narrow propod subovate, longer and more slender than in gnathopod 1; two groups of longer and stronger spines at palmar angle.

Peraeopods 3 & 4 relatively short and stout; bases,

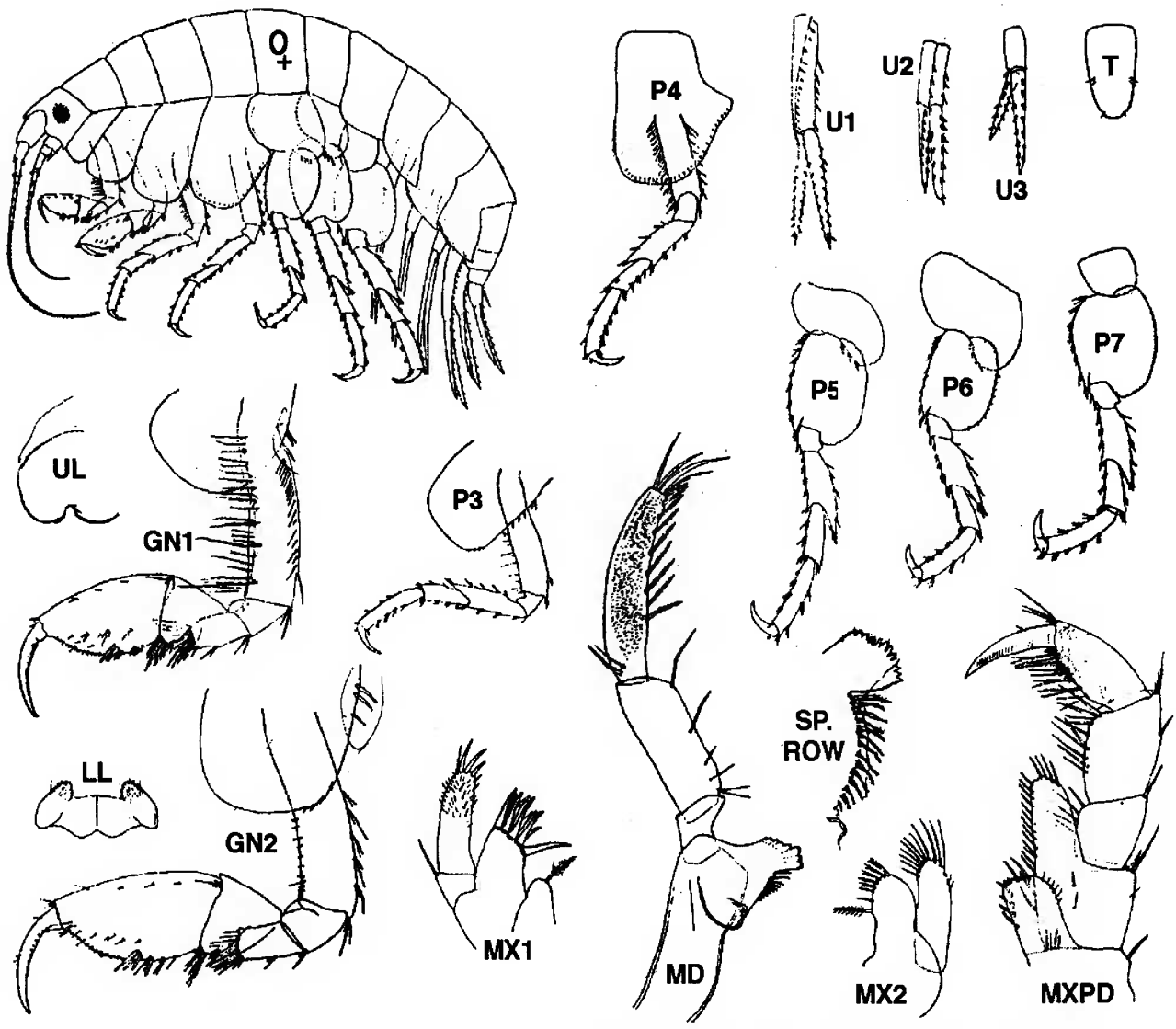

FIG. 29. *Incisocalliope aestuarius* (Watling & Maurer, 1973). Female (4. 0 mm). Delaware Bay.

anterior and posterior margins moderately strongly setose; segment 5 shorter than 4; segment 6, hind margin with 3 groups of stout spines; dactyl heavy, medium. Peraeopods 5-7, bases only moderately broadened, least in peraeopod 7, postero-distal lobes large, deep, reaching segment 4; segment 5 shorter than 4; dactyls stout.

Pleon plate 3, lower margin weakly spinose, hind corner squared, not acuminate. Pleopod peduncles, outer margin strongly setose. Uropods 1 & 2 large, extending well beyond uropod 3. Uropod 1, peduncle large, outer margin finely spinose. Uropod 2, outer ramus distinctly the shorter. Uropod 3, outer ramus long, length ~2/3 long inner ramus, with 6 pairs marginal spines. Telson oblong, apex subacute.

Distribution. Ariake Sea, Japan; sublittoral.

Taxonomic commentary. Hirayama likened *Inciocalliope filialis* to *Incisocalliope derzhavini* but found several species differences. The species is an atypical *Parapleustes,* with several features more reminiscent of *Gnathopleustes*. These include the unlike gnathopod propods, narrow peraeopod bases; and in mouthparts, the broad lower lips, "shoulder" seta on palp of maxilla 1, etc. The species is close to *I. dilatatus* in the armature of the maxilliped palp.

Incisocalliope aestuarius (Watling & Mauer)
(Fig. 29)

Parapleustes aestuarius Watling & Mauer, 1973: 252, figs. 1-4.—Fox & Bynum, 1975: 230.—Ishimaru, 1984: 431.—Barnard & Karaman, 1991: 650.

Diagnosis. Female (4.0 mm): Head, eye small round, black. Antenna 1, peduncular segment 1 large, stout, length about equal to segments 2 & 3 combined. Flagellum long, ~40 segments. Antenna 2, peduncular segments 4 & 5 short, medium, segment 5> 4; flagellum ! 25-segmented.

Mandible, spine row with ~14 slender blades, distally largest; left lacinia 10-dentate; palp segment 3 with 8-9 slender pectinate "D" spines. Maxilla 1, segment 1 with

single shoulder seta; segment 2 , with numerous short facial setae, rounded apex with 4 spines; outer plate, inner apical spine elongate. Maxilla 2, inner plate not broadened. Maxilliped, inner plate with 2-3 apical marginal "button" spines; outer plate with 4 apical slender spines; palp segment 3 distally with pectinations at base of dactyl.

Coxal plate 1 short, lower margin convex, hind corner with 2-3 cusps posterior margin with 2-3 stout spines. Coxa 4 little broadened deeper than wide. Coxa 5 deep. Gnathopods relatively weakly subchelate; basis, anterior margin lined with numerous (20+) setae some longer the width of basis, hind margin strongly lined with shorter setae; merus lacking distal cusp; propod relatively short, not deeper than carpus; with superior and inferior facial clusters of small setae; hind margin shorter than palm, with single distal setal group. Gnathopod 2, basis distal with short setae, hind margin distally with several setal groups; merus with short posterior tooth; propod, hind margin with 2 distal setal groups.

Peraeopods 3 & 4 basis, anterior margin strongly short-setose; segment 5 shorter than 4; dactyls relatively short. Peraeopods 5-7, bases moderately broadened, hind margins convex; segment 5 slightly shorter than 4.

Pleon plate 3, hind corner acuminate, slightly produced. Uropods 1 & 2 strong, rami longer than peduncle. Uropod 1, peduncle, outer margin strongly spinose; rami subequal. Uropod 2 outer ramus little shorter than inner, margins strongly spinose. Uropod 3 rami long, slender, inner ramus with 7 pairs of margins spines. Telson medium long, apex rounded.

Distributional ecology: From Delaware Bay, Chesapeake Bay to Albemarle Sound and estuaries of the southeastern states, on wharf pilings, among bryozoans, hydroids, and other sessile invertebrates.

Taxonomic & distributional commentary. The original description (as *Parapleustes aestuarius*) is limited in a number of features, some of which were pointed out by Fox & Bynum (loc. cit.). The species is remarkably close morphologically to *Incisocalliope filialis* from the Sea of Japan. The relationship appears closely phyletic, but the disjunct distribution of the two forms defies explanation that is entirely satisfactory (see p. 130).

Trachypleustes, new genus

Type species. *Trachypleustes vancouverensis*, new species.

Species composition. *Trachypleustes trevori*, new species (and varieties: Pribilof Islands, San Juan Batista I).

Diagnosis. A group of small, smooth-bodied pleustids having short antenna 1 peduncular segments, unequal gnathopods, slender legs, slender unequal rami of uropods, and heavily chitinized, "molarized", or otherwise strongly modified mandibular blades.

Body smooth above, slender. Head small; rostrum slightly produced beyond subacute head lobe. Eyes large. Antennae slender, elongate. Antenna 1, peduncle 1 large, without postero-distal process; segment 2 medium short; accessory flagellum minute, triangular, with a few apical setae. Antenna 2, peduncular segments 4 & 5 subequal, setose; flagellum elongate.

Mouthparts strongly modified. Upper lip moderately incised and asymmetrical. Lower lip broad, squat, outer lobes oblique. Mandible, molar minute; spine row with few (4-6), strongly thicked and/or flattened blades; left lacinia irregularly 10-11 dentate; incisor multidentate; palp, segment 3 longest, medial pectinate setae numerous (12+); segment 2 sparsely setose medially. Maxilla 1, outer plate short, spines tall; palp long, apex with slender spines and setae, segment 1 lacking lateral setae; inner plate l-setose. Maxilla 2, inner plate medium broad, with 1 large inner plumose seta; maxilliped, palp and dactyl strong; inner plate short, apex sloping, with 3-5 button-teeth and 4-6 inner marginal setae; outer plate narrow, apex and inner margin slender-spinose.

Coxal plates 1-4 increasing in size posteriorly; coxa 1 small, not expanded distally; coxa 2-4 deeper than body plates; lower margins nearly straight, with hind cusp. Gnathopods 1 & 2 weakly subchelate, similar in form but unequal in size, not sexually dimorphic; gnathopod 2 distinctly the larger. Gnathopod 1, basis weakly setose anteriorly; carpus shallow, more than half length of propod; length of palm oblique, with small median tooth; length about equal to smooth hind margin; postero-distal angle with 2 groups of spines; dactyl slender. Gnathopod 2, carpus shorter, hind lobe deeper, anterior margin about half length of propod; 2-3 spine groups at posterior angle.

Peraeopods 3-7 slender, dactyls normally developed. Peraeopods 5-7 normally homopodous; bases regularly broad and rounded behind; segment 4 (merus) postero-distal process strongly overhanging segment 5.

Pleon plates 1-3 regular; lower margins spinose, hind corners variously acuminate. Pleopods strong, not sexually dimorphic.

Urosome 2 not occluded dorsally. Uropods 1 & 2 slender, marginally strongly spinose; rami unequal, inner ramus longer than peduncle. Uropod 3, rami markedly unequal, strongly spinose. Telson medium, apex rounded; penicillate setae slightly proximal to mid point.

Coxal gills small to medium, saclike, largest on peraeopods 4 & 5.

Distributional commentary. Members of the genus are known only from northern parts of the North American Pacific coastal marine region, in association with sponges and large sessile invertebrates.

Etymology. A combining form of the Greek root "*trachytés*" roughness, and the generic name *Pleustes*, that alludes to the rough, molarlike appearance of the mandibular blades

Taxonomic Commentary. This generic group is distinguished by the heavily molarized and pavementlike mandibular blades, the unequal, non sexually dimorphic gnathopods, slender peraeopods, and the elongate, spinose uropod rami. Phyletically the genus *Trachypleustes* appears closest to *Gnathopleustes*, but more distant from *Incisocalliope.*

Trachypleustes vancouverensis, new species
(Fig. 30)

Material examined.
eBRITISH COLUMBIA.
Northern Vancouver I.: ELB Stn O1, Cape Scott, Experiment Bight, under boulders, among algae, LW level, July 18, 1959. - female ov. (4.5 mm), **Holotype** (slide mount), CMN Cat. no. NMCC1995-0086.

Diagnosis. Female ov. (4.5 mm): Head, rostrum prolonged beyond lateral head lobe; eye subquadrate. Antenna 1, peduncular segment 1 long, extending to midpoint of peduncular segment 4 of antenna 2; flagellum ~28-segmented. Antenna 2, length about equal to antenna 1; flagellum ~28-segmented.

Lower lip, inner lobes very broad, shallow. Mandible, molar process prominent, apex blunt; spine row distally with 4 thick short blades having rough, conical apices, and proximally with several short vestigial blades; cutting edge of incisor with 7-8 unequal teeth; palp segment 3 apex blunt, inner distal margin with 12 slender pectinate "D" spines; left lacinia large, broad, cutting edge with 10 small uneven teeth. Maxilla 1, palp slightly narrowing distally, rounded apex with 6 slender spines. Maxilla 2 outer plate narrow. Maxilliped, inner plate short, with 3 inner marginal plumose setae, and 4 apical button spines; outer plate slender, narrowly subtruncate, with 2 very slender spines; palp ordinary.

Coxae relatively deep, broad, hind corners with single small cusp. Gnathopod 1, propod about half size of propod of gnathopod 2; palmar margin smoothly continuous with posterior margin; proximal spine group at postero-distal angle with single spine and split-tipped seta; posterior margin distally with single spine and setae. Gnathopod 2, carpal lobe, some distal setae pectinate; propod stout, subovate; proximal spine group at postero-distal angle with 5 spines and split-tipped seta; posterior margin distally with small cluster of split-tipped setae.

Peraeopods 3 & 4 ordinary, slender; segment 4, anterior margin with 3-5 tufts of slender spines; dactyls strong. Peraeopods 5-7 closely homopodous; bases broad, hind margins smoothly convex; margins of segments 4-6 with cluster of short spines; segment 5 slightly shorter than 4; dactyls strong, curved.

Pleon plates 1-3, hind corners acuminate. Urosome 2 with free dorsal margin. Uropod 3, outer ramus relatively long, ~60% of inner ramus.

Telson distally with several dorsal setules; apex unevenly rounded. Coxal gills on peraeopods 4-6 relatively large, broadly saclike.

Etymology. The name alludes to the type locality on Vancouver Island, British Columbia.

Distributional ecology. The species has been confirmed only for the type locality, Northern Vancouver Island, from under rock and algal habitats at LW level

Taxonomic commentary. The species name *vancouverensis* alludes to its known distribution on Vancouver Island, British Columbia.

Trachypleustes trevori, new species
(Figs. 31, 32, 33)

Material examined. About 130 specimens taken at 23 localities, as follows:
ALASKA.
Pribilof Islands: D. B. Quayle coll., Nov. 23, 1965 - 1 female ov (slide mount).
Southeastern Alaska. ELB Stns,. 1961: A168, Klokachef I - 1 female; A175 , San Juan Batista I., under rock, among algae, LW level, July 26, 1961 - 1 female ov. (slide mount).
BRITISH COLUMBIA.
Queen Charlotte Islands: ELB Stn. E14a, Onward Pt. Moresby I. July 13, 1957 - 1 ov. female (slide mount), 2 other specimens.
Northcentral coast. ELB Stns., July, 1964: H7, McCauley I. - 1 female ov; H65, Christie Pass - 2 females ov (slide mounts), 1 im. ELB , 1959, Stn. N22, off Banks I. - 1 male (slide mount), 1 female, 28 other specimens.
Northern Vancouver I.: ELB Stns., July, 1959: V5, Lemon Pt., Nigei I. - 1 female ov (Slide mount); O3, Grant Bay - 5 females ov (2 slide mounts).
Southern Vancouver I.: ELB Stns., July 1970: P702 , Long Beach, south end, from algae and sessile invertebrates, under boulders, at LW level July 6 - 1 female; P719, Botanical Beach, from kelp and sponges, under boulders at LW level, Aug. 1 - 1 female ov.
ELB Stns., 1975: P2, Bamfield Marine Laboratory, from floating log fouling community at surface, July 23 - 1 male, 1 female, 2 im.; P5c, Taylor I., Trevor channel, from ascidians and sponges, under large boulder, July 25 - 2 males, 2 females.
ELB Stns., 1976 : B4, Off Brady's Beach, naturalist's dredge, 60-70 m, sand & algae June 25 - 1 female; B7, Wouwer I., Broken I., from algae and sponges on bedrock walls at LW, June 27 - 1 male, 1 female; B11b, Wickininnish Bay, south end, LW sandy mud, June 29 - 2 females; B28, Edward King I., among algae, under boulders, LW, July 10 - 1 female.
ELB Stns., 1977: B13, Trevor Channel, off Brady's Beach, 6-14 m naturalist's dredge, sand, stone, algae, May 25, 1977

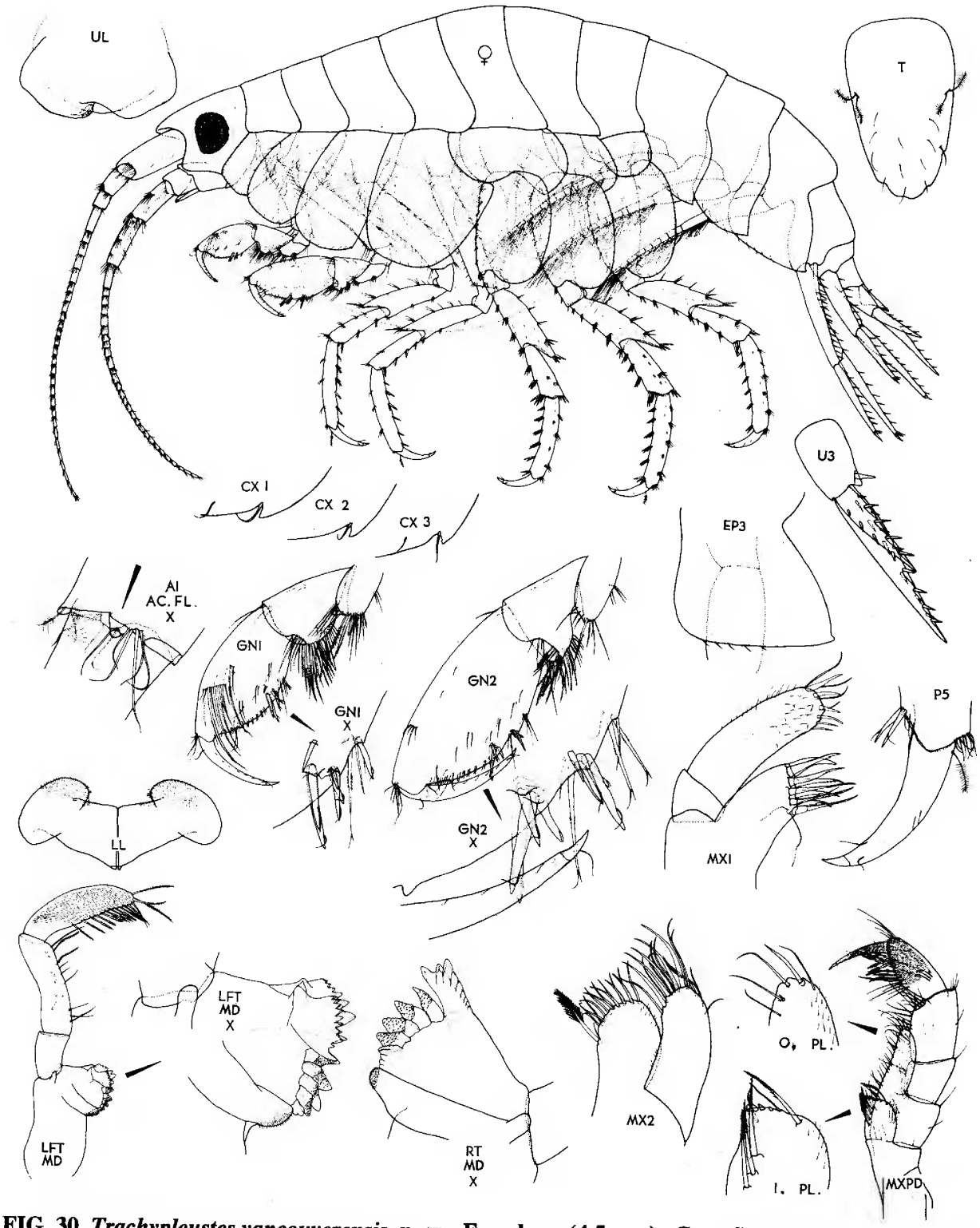

FIG. 30. ***Trachypleustes vancouverensis*****, n. sp. Female ov (4.5 mm). Cape Scott, Vancouver Island.**

- female (5. 0 mm), **Holotype** (slide mount), CMN Cat. No. NMCC1995-0084; 2 females, **Paratypes**, CMN Cat. No. NMCC1995-0085. B21b, Off Brady's beach, 10-20 m naturalist's dredge, algae, debris over sand, June 1 - 3 females (1 slide mount).

Off Edward King I., from sponge, W. C. Austin Stn. 101/76 - 1 male (slide mount), 2 females.

Race Rocks, Vancouver I., LW level,Anita Voss coll., April 25, 1986 - 1 male (slide mount) + ~40 other specimens.

WASHINGTON-OREGON

Coastal localities. ELB Stns., July-August, 1966: W40, Mukkaw Bay at Sooes Pt. - 2 females, 12 male (slide mounts); W58, Seal Rock - 1 male (slide mount).

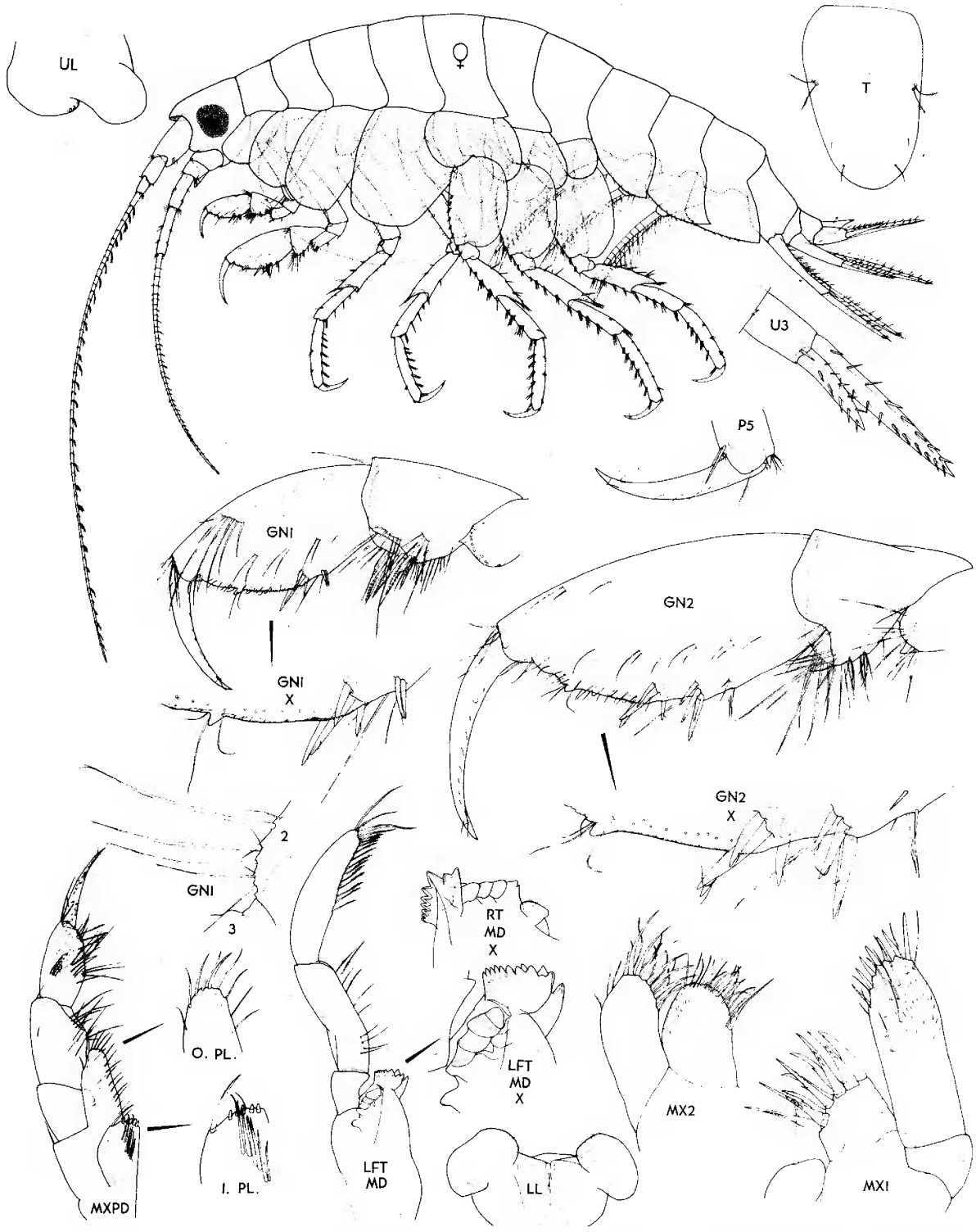

FIG. 31. *Trachypleustes trevori,* new species. Female ov (5.0 mm). Trevor Channel, B. C.

Diagnosis. Female ov. (5.0 mm): Head, rostrum short, little exceeding lateral process; eye nearly round. Antenna 1 much longer than antenna 2; peduncular segment 1 not exceptionally large, length slightly longer than segments 2 & 3 combined; flagellum with ~42 segments, alternately with aesthetascs. Antenna 2, peduncular segments 4 & 5 relatively short, slender; flagellum with ~38 short segments, each with whorl of short setae.

Lower lip, inner lobes relative narrow and deep. Mandible, molar minute much smaller than blades; spine row with 4-5 very short, thick, flat, pavementlike blades; cutting edge of incisor with 9-10 uneven teeth, smallest distally; palp segment 3 narrowing gradually, inner margin with 12 slender pectinate "D" spines; left lacinia broad, deep, cutting edge with 10 uneven teeth. Maxilla 1 palp cylindrical, obliquely rounded apex with 7 slender spines. Maxilla 2,

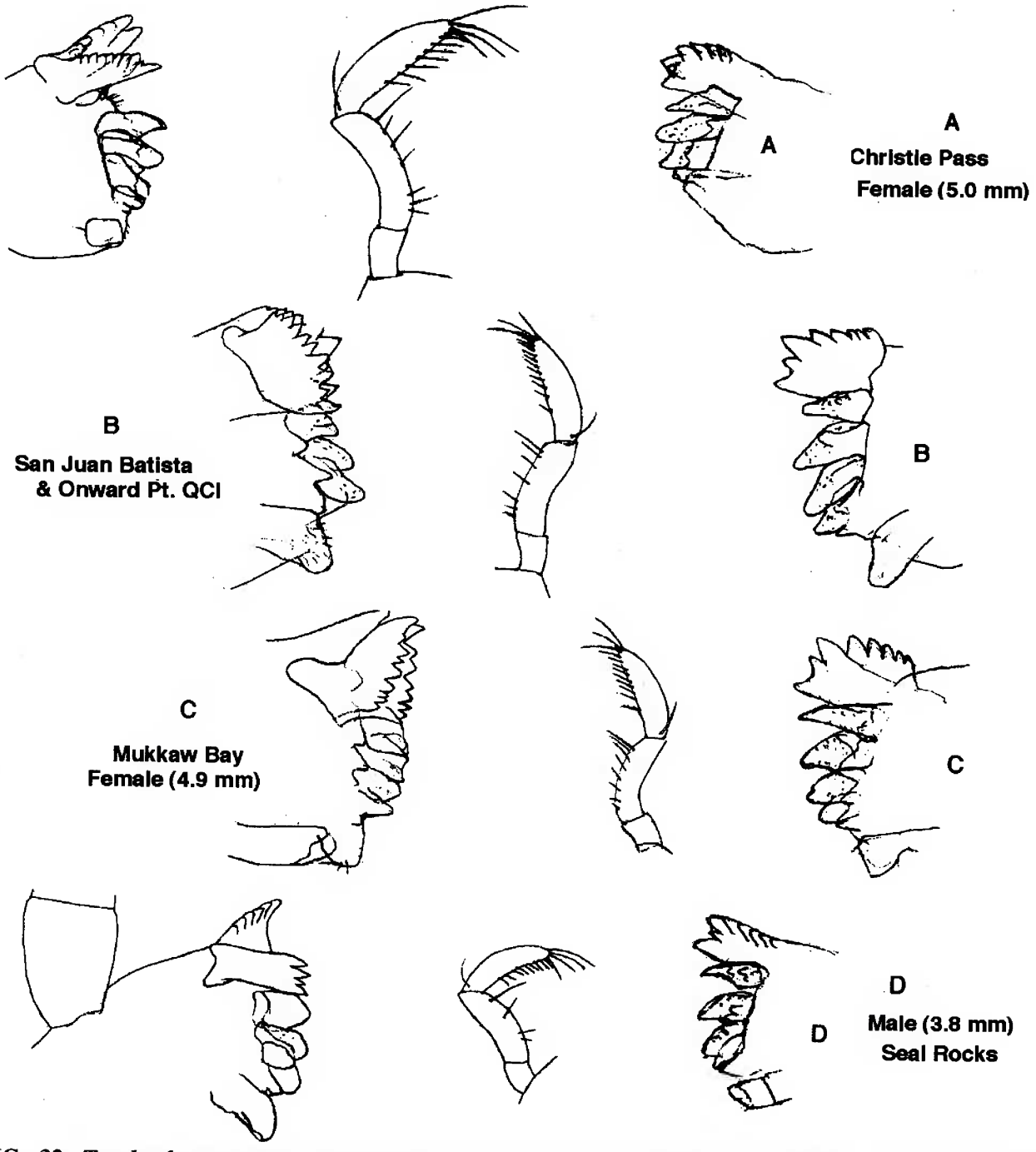

FIG. 32. ***Trachypleustes trevori,*** **new species. A.-D locations; variations in mandibular blades & palp.**

outer plate regular. Maxilliped, inner plate with 6 inner marginal setae and 4 apical marginal "button" spines; outer plate, apex narrowly rounding, with singly slender spine; palp ordinary.

Coxae 1-3 medium, relatively shallow, hind corners each with single small cusp. Gnathopod 1, propod much smaller than propod of gnathopod 2; proximal spine group at postero-distal angle with 2 spines; hind margin smooth, lacking spines or setae. Gnathopod 2, carpal lobe lacking pectinate setae; propod with proximal group of four spines at postero-distal angle; hind margin with distal cluster of short simple setae.

Peraeopods 3 & 4 ordinary, slender; segment 4, anterior margin weakly setose; dactyls medium. Peraeopods 5-7, bases not exceptionally broad, increasing posteriorly; segments 4-6, margins with clusters of short spines; segment 5 not shorter than 4; dactyls medium, curved.

Pleon plates 1 & 2, hind corners acuminate; pleon plate 3, hind corner squarish. Urosome 2, dorsal margin nearly occluded by segments 1 & 3. Uropods 1 & 2 long, slender, margins of rami strongly serially spinose. Uropod 3, outer ramus short, length ~1/2 slender inner ramus having 7-8 pairs of marginal spines.

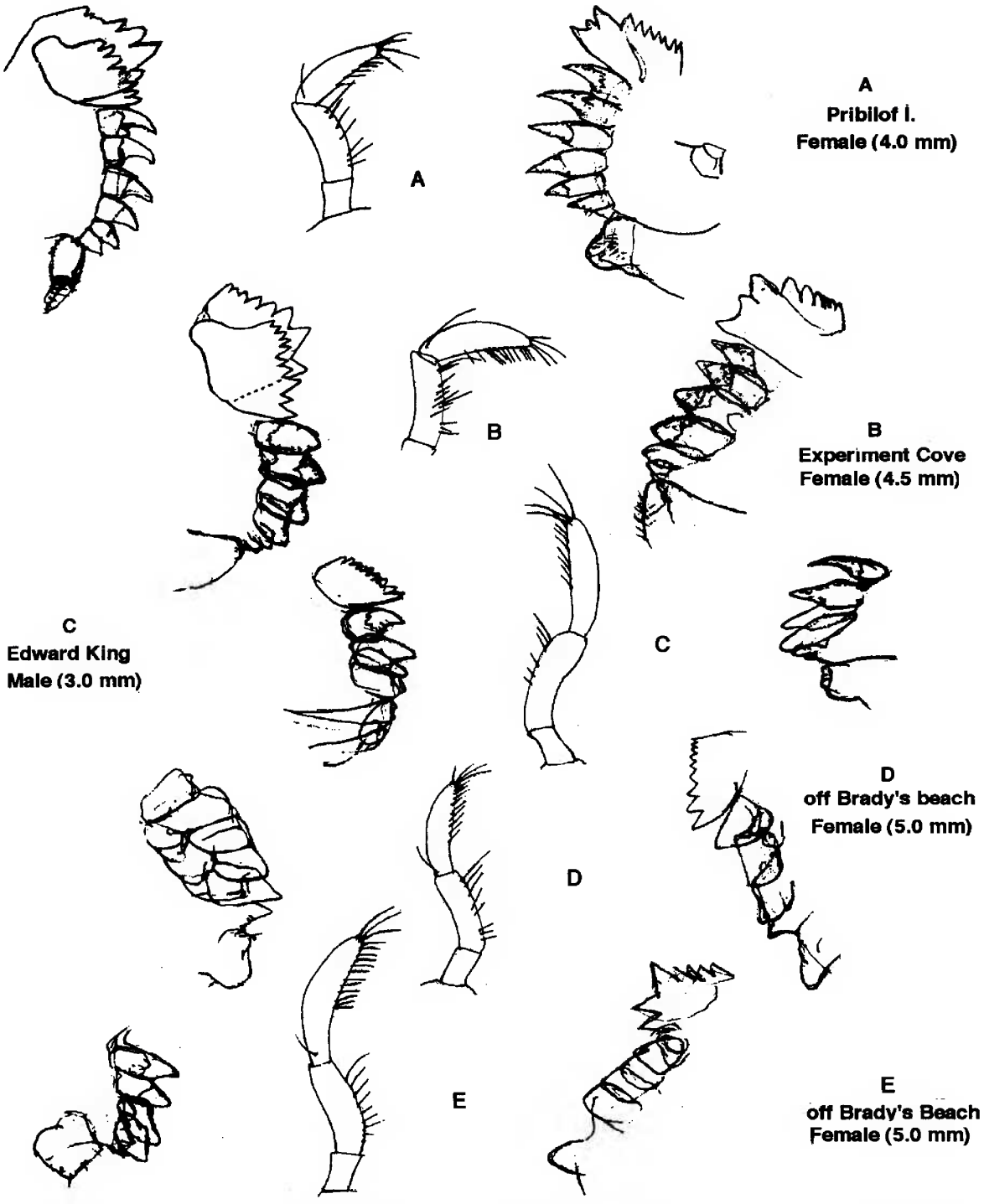

FIG. 33. *Trachypleustes trevori*, new species. A-E locations. Variations in mandibular blades & palp.

Telson ordinary, apex smoothly rounded. Coxal gills on peraeopods 4-5 short, saclike

Etymology. The species name alludes to the type locality in Trevor Channel, Vancouver Island, British Columbia.

Distributional ecology. The species ranges from southeastern Alaska, commonly throughout British Columbia to central Oregon, along exposed rocky coasts, associated with sponges and tunicate in under-rock habitats at LW level.

Taxonomic commentary. Material from the following stations are presently considered variants of*T. trevori* . This treatment is not entirely satisfactory, since "variants" may prove to be specifically distinct when more extensive material can be studied:

T.rachypleustes (small-eyed variety, Fig. 32D) having only 3-4 "pavement blades", at Stns. A175; H14a: W40; W58.

T.rachypleustes (northern variety, Fig. 33A) having 5-6 thick, acute blades, palp with 6-7 pectinate spines, from the Pribilof Islands, Bering Sea.

Micropleustes, new genus

Parapleustes Barnard, 1969a: 425 (partim).—Ishimaru, 1984: 432 (partim).—Barnard & Karaman, 1991: 649 (part).

Type species. *Parapleustes nautilus* J. L. Barnard 1969b: 199.

Species composition. *Micropleustes behningi* (Ishimaru, 1984); *M. behningioides,* new species; *M. longimanus* (Ishimaru, 1984); *M. nautiloides*, new species.

Diagnosis. Body small, smooth to slightly rugose above. Head, rostrum very short; head lobe subacute; inferior antennal sinus elongate, shallow. Eyes small, roundish. Antennae short, subequal, flagella little longer than respective peduncles, weakly setose; accessory flagellum minute. Antenna 1 slightly the longer in male.

Mouthparts somewhat modified. Upper lip shallowly and submedially notched, lobes slightly asymmetrical. Lower lip wide, inner lobes deep, outer lobes oblique, rounded. Mandible: incisor with few (6-8) teeth; left lacinia 6-9 cuspate; blades medium heavy, distally pectinate, 7-9 in number; molar small, apex blunt, weakly setulose; palp segments relatively short, stout; segment 2 with few (3-8) inner marginal setae; segment 3 subequal with few (5-10) inner marginal pectinate setae. Maxilla 1, outer plate with 9 tall apical spine-teeth; inner plate with single apical setae, occasionally lacking; palp segment 2 normal, apex with 4 short spines, segment 1 with 1+ outer marginal setae. Maxilla 2, inner lobe slightly broadened, inner margin often with 2 plumose setae. Maxilliped, segment 3 not conspicuously enlarged, longer than palp segment 1; dactyl strong, palp segment 3 lacking distal process; inner plate with 1-2 stout, apically pectinate inner marginal setae.

Coxal plates large, broad, deep; coxa 1 not broadened or bent forward distally; postero-distal notch minute, often multiple (2-4). Gnathopods small to medium strong, not sexually dimorphic; propod tending to elongation; carpus variable, hind lobe short or lacking; palm of propod shorter than posterior margin, smoothly convex, lacking median tooth, postero-distal angle with 1-2 groups of spines.

Peraeopods 3-7 short, medium stout, normally spinose; segment 5 distinctly shorter than 4; dactyls normal, strong. Peraeopods 5-7 regularly homopodous, bases very broad.

Pleon side plates deep, medium broad, hind corners little produced. Pleopods normal, not sexually dimorphic, rami subequal, slightly longer than peduncles. Urosome short, segment 2 nearly occluded dorsally. Uropods short; rami of uropod 1 and uropod 2 subequal, outer slightly the shorter, sparsely spinose, about equal in length to peduncle. Uropod 3 short, extending less than twice length of telson; outer ramus distinctly the shorter.

Telson elongate, dorso-lateral penicillate setae markedly distal. Coxal gills of two types: anterior two pairs slender, sublinear; posterior three pairs larger, platelike, smallest on peraeopod 6.

Etymology. A combining form of the Greek "mikros " (small) and the root generic name "pleustes", referring to the small body size of component members of the genus.

Distributional ecology. All five species of the genus are endemic to the North Pacific region, three on the Asiatic, and two on the North American coast.

Taxonomic commentary. Within subfamily Parapleustinae, the genus *Micropleustes* occupies a somewhat isolated position. It combines a number of relatively plesio-morphic character states, especially in the mouthparts, with a relatively advanced condition of the antennae, coxal plates, gills, uropods, and telson. In balance, however, the genus is least distant from the type genus *Parapleustes* (p. 127).

Micropleustes nautilus (J. L. Barnard)
(Fig. 34)

Parapleustes nautilus J. L. Barnard, 1969b: 199, fig. 55.—Austin, 1985: 592.—Staude, 1987: 379, fig. 18.77.—Barnard & Karaman, 1991: 650.

Material examined. About 185 specimens in 44 lots:
ALASKA.
Bering Sea: Attu I., Massacre Bay, C. E. O'Clair coll., June 23, 1972 - 2 females.
Amchitka I., Banjo Pt., Sta. B1G1, C. E. O'Clair coll. Aug. 14, 1971 - 32 specimens incl. males, females, im. (male, female slide mounts); Ibid., Stn. IA-2, plot 28, bedrock reefs uplifted by underground nuclear tests, May 22, 1974 - 2 females.
Southeastern Alaska. ELB Stn. S5B7, 1980 - 1 female.

BRITISH COLUMBIA.
Queen Charlotte Islands. ELB Stns., June-July, 1957: W4a (1); W12 (1); W9a (1); H14 (1).
Northcentral coast. ELB Stns., July, 1964, 1959: H1(4); H33 (8); H39 (2); H44 (~20); H47 (1); N1 (1).
Vancouver I., north end. ELB Stns, July, 1959: O1 (4); O5 (1); 07b (4); O15 (1).
Vancouver I., southern end. ELB Stns., July-August, 1955: F1 (2); P4 (1); P6c (3).
ELB Stns., 1970: P702 (2); P712 (7). ELB Stns., 1975: P3a (2); P5a (2); P5b (2); P5d (3); P20 (2). ELB Stns., 1976: B3 (1); B13 (5); B28 (2). ELB Stns.,1977: B6a (1); B8 (2); B11b (1); B19b (2).
Wizard Inlet, D. Kittle Stn. 712, July 28, 1972 - 1 male, 1 female (fig'd specimen) (slide mounts) + 1 female, 3 im.
Barkley Sound, Broken I. group, C. Lobban coll., July 7, 1971 - 1 female; Ibid., July 9 - 10 specimens. Bordelais I., from sponge at LW level, R. J. Anderson coll., June 26, 1976 - 1 male (slide mount).

WASHINGTON-OREGON.
Coastal localities. ELB Stns., July-August, 1966: W22 (1); W40 (8); W58 (~15); W60 (6).

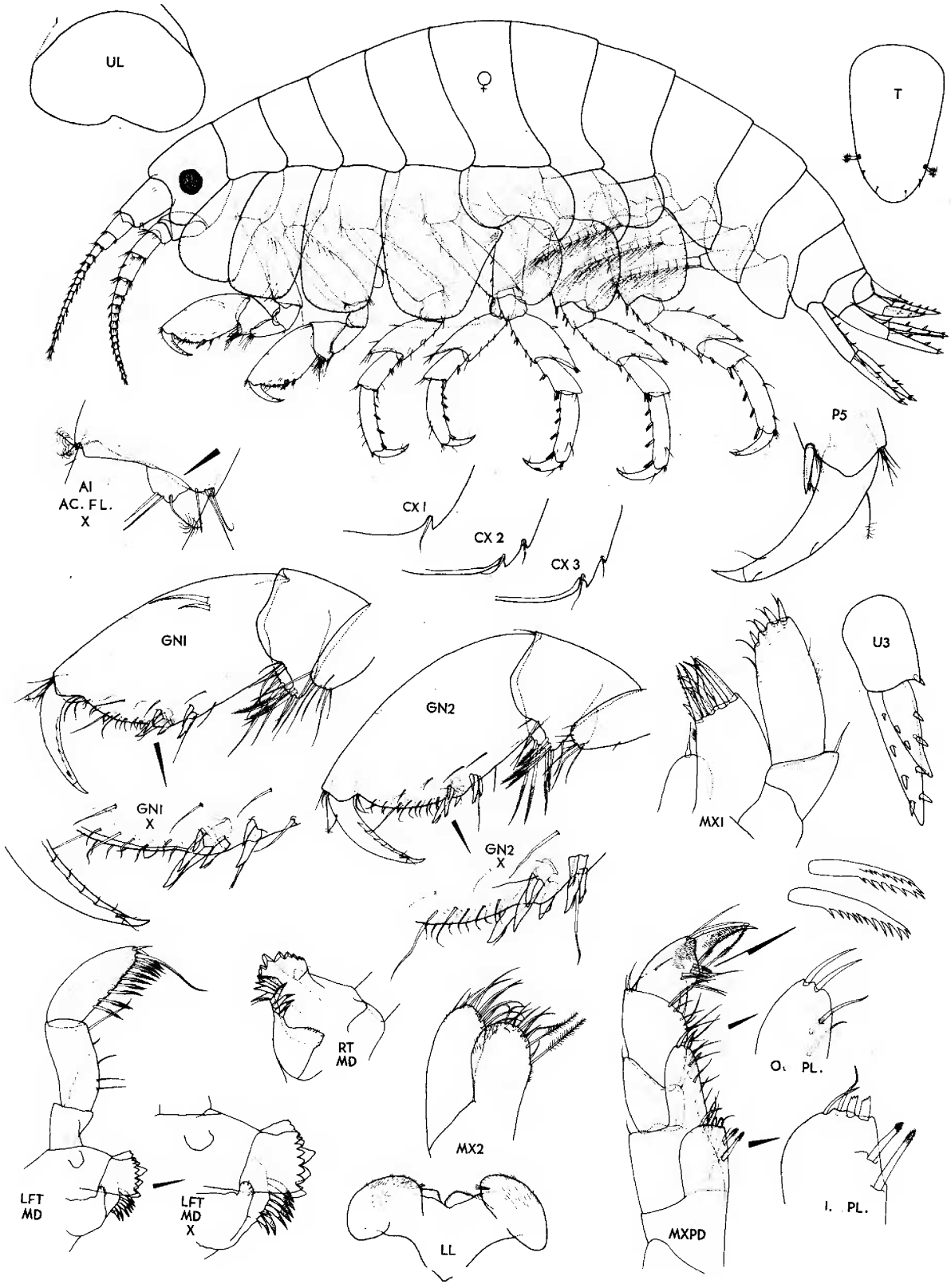

FIG. 34. ***Micropleustes nautilus*** **(J. L. Barnard). Female ov (3.1 mm). Wizard Inlet, B. C.**

KEY TO SPECIES OF *MICROPLEUSTES* OF THE NORTH PACIFIC REGION

1. Gnathopods, propod elongate, length of lower margin ~2Xpropod depth; palm of propod short, length less than half that of posterior margin; maxilla 1, inner plate bare; inner ramus of uropods 1 shorter than peduncle ..... 2.
—Gnathopods, propod not elongate, length less than twice depth; propod palm normal, length more than half posterior margin. maxilla 1 inner plate with single apical seta; uropods 1, inner ramus not shorter than peduncle ..... 3.

2. Gnathopod 1, carpus distinctly longer than carpus of gnathopod 2; coxal plates 1-4 only slightly deeper than corresponding body plates; peraeopods 5-7, segment 4 wide, width = length; telson length about twice width, linguiform in shape ..... *M. longimanus* (p. 117)
—Gnathopod 1, carpus about equal to that of gnathopod 2; coxal plates 1-4 very deep, much deeper than corresponding body plates; peraeopods 5-7, segment 4 normal, length distinctly greater than width; telson length about 3 X width, apex narrowly rounding ..... *M. nautiloides*, n. sp. (p. 113)

3. Peraeopod 7, segment 4 postero-distally nearly totally overhanging segment 5 ... *M. behningi* (p. 115)
—Peraeopod 7, segment 4 less broad, postero-distally overhanging segment 5 by 1/2 to 2/3 ..... 4.

4. Gnathopods, palm of propod distinctly shorter than posterior margin; postero-distal palmar angles with two distinct groups of spines; telson regularly narrowing distally ..... *M. nautilus* (p.111)
—Gnathopods, palm of propod about equal in length to posterior margin, postero-distal angle with two tight clusters of spines appearing almost as one group; telson, margins constricted medially ..... *M. behningioides* (p. 116)

Coos Bay, Oregon, K. E. Conlan Stn. 08-23 - 2 females, 8 other specimens.

Diagnosis. Female ov (3.2 mm): Body and coxal plates medium deep. Head, eye round, black. Antenna 1 medium, peduncle 1 large, length> segments 2 & 3 combined; flagellum 14-segmented. Antenna 2, slightly longer than 1, peduncular segment 4 & 5 subequal; flagellum 14-segmented.

Upper lip with broad apical V-cleft; lobes asymmetrical. Lower lip, inner lobes shallow, outer lobes smoothly ovate, oblique. Mandible, molar very small apex rounded; spine row with 7-9 medium, distally pectinate blades; cutting edge of incisor with 7-8 unequal teeth; palp segment 3 with 9 inner marginal pectinate spines and 1 long terminal seta; left lacinia 8-dentate. Maxilla 1, inner plate with single apical seta, palp segment 1 with single "shoulder" seta; segment 2 slightly broadest medially, apex with 4 spines. Maxilla 2, inner plate slightly broadened distally, inner margin with 2 plumose setae. Maxilliped, inner plate with 2 inner marginal spines and 2 apical teeth; outer plate medium, narrowing to rounded apex, with 2 slender curved spines; palp, dactyl slender minutely pectinate, not longer than segment 3.

Coxa 1 broadest distally. Coxa 5, lobes shallow. Gnathopod 1, carpus short, deeper than long; propod short-rectangular, length ~1.5 X depth, with proximal cluster of 2 stout median facial setae; palmar margin short, convex, postero-distal angle with cluster of 5 spines; hind margin nearly straight, with distal cluster of 2 spines; dactyl weakly setulose behind. Gnathopod 2 subsimilar, propod slightly heavier and deeper than in gnathopod 1.

Peraeopods 3 & 4 relatively short and stout, segment 4 slightly broadened; dactyls short. Peraeopods 5-7 closely homopodous in size and form; bases broad, rounded behind, postero-distal lobe medium deep; segment 4 slender, postero-distal lobe overhanging segment 5 by half its length; dactyls medium, length about 1/2 segment 6.

Pleon plate 3, hind corner not acuminate. Uropod 1 slender, rami subequal, with 1-2 marginal spines. Uropod 2, rami subequal, slightly shorter than peduncle. Uropod 3, outer ramus short, with 3-4 marginal spines, length ~1.5 X each of peduncle and outer ramus.

Telson medium, slightly narrowing distally to rounded apex, penicillate setae distal.

Distribution. From SE Alaska to middle and southern California, intertidal to shallow depths (5 m), associated with under-rock algal and sponge communities.

Taxonomic commentary. Morphological variations were noted in O'Clair material from Alaska, and in ELB material at Stns. P712 and W40, but were not considered significant at the species level.

Micropleustes nautiloides, new species
(Fig. 35)

Parapleustes species "A" J. L. Barnard, 1969b: 203?

Material examined:

BRITISH COLUMBIA.

Southern Vancouver I.: ELB Stn. P712, Off Hanes I., Trevor Channel, under boulders and algal mats, LW level, July 21, 1970 - 4 males, 2 females, 2 im.

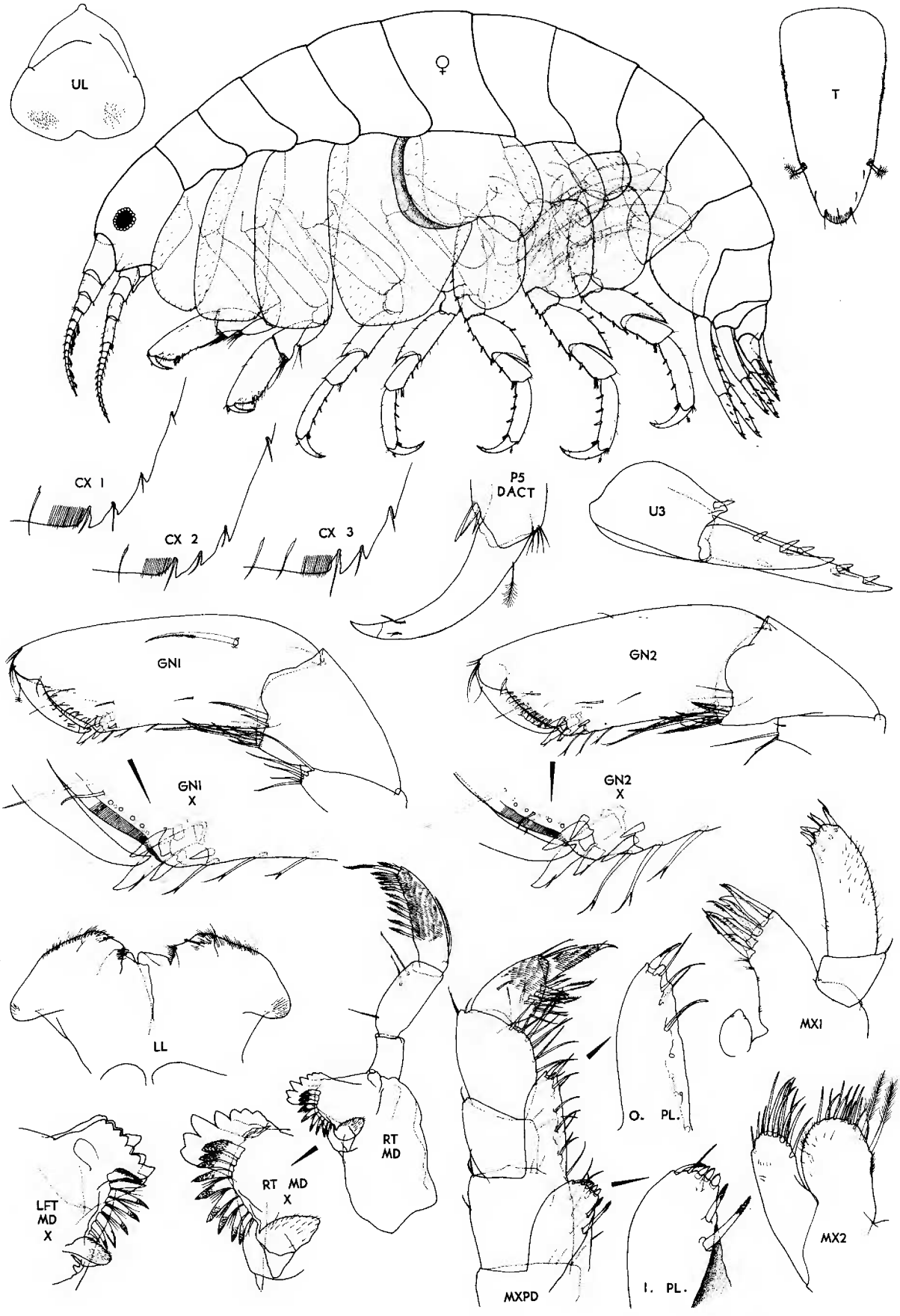

FIG. 35. ***Micropleustes nautiloides,*** **new species. Female ov (2.9 mm). Sunset Bay, Oregon.**

WASHINGTON-OREGON.
Coastal Localities. ELB Stn. W40, Mukkaw Bay, at Sooes Pt., from bedrock walls and under boulders, LW level, July 31, 1966 - 9 specimens. Sunset Bay, south of Charleston, Coos Co., K. E. Conlan Stn. 06-06, in *Rhodomela larix*, July 8, 1986 - female (2.9 mm) **Holotype** (slide mount), CMN Cat. no. NMCC1995-0074; Ibid., Stn. 06-03 - 3 females (to 3.1 mm) (1 slide mount), Paratypes, CMN cat. No. NMCC1995-0075; Ibid., Stn. 06-12 - 9 females ov, 3 imm; Ibid., Stn 08-6 - 2 im.

Diagnosis. Female ov (2.9 mm): Body and coxal plates deep. Head small, flat-rounded, black. Antennae short. Antenna 1, peduncular segment 1, length = segments 2 & 3 combined; flagellum 11-segmented. Antenna 2, slender, slightly the longer, flagellum 11-segmented.

Upper lip deep, with narrow apical V-notch; lobes nearly symmetrical. Lower lip inner lobes deep, outer lobes large, oblique. Mandible, molar medium, apex sharply rounded; spine row with 7-9 stout distally pectinate blades; cutting edge of incisor with 7 unequal teeth; palp segment 3 with elongate basal "A" seta, inner margin with 9 pectinate spines; left lacinia 8-dentate. Maxilla 1, inner plate small, lacking apical set; palp segment 1 with single "shoulder seta; palp segment , narrowing, with 4 apical spines. Maxilla 2, inner plate broad, with 2 inner marginal plumose setae. maxilliped inner plate large, narrowing distal with 2 inner marginal spines, and 3 apical marginal short spines; outer plate relatively tall, with single curved spine at subconical apex; dactyl nearly straight, minutely pectinate, not longer than segment 3.

Coxal 1 little expanded distally, hind corner with 3 small cusps. Coxae 2-3, depth ~2X width, hind corners each with 3 small cusps. Coxa 4, width = depth. Coxa 5 , lobes deep. Gnathopod 1, carpus longer than deep, hind lobe shallow, short; propod slender, elongate, length ~2X depth, palmar margin short, oblique convex, postero-distal angle with group of 4-5 spines, one distinctly largest; hind margin straight, with distal cluster of 2 short spine and a few cleft-tipped setae; dactyl short, weakly setulose behind. Gnathopod 2 closely subsimilar, propod slightly stouter.

Peraeopods 3 & 4, slender; dactyls medium. Peraeopods 5-7 homopodous; segment 4 relatively short, broad, postero-distal process overhanging 2/3 of short segment 5; dactyls large, length > 1/2 segment 6. Peraeopod 5 slightly shortest; basis broadest, rounded behind; bases of peraeopods 6 & 7 less expanded, hind margin nearly straight.

Pleon plate 3, lower margin convex, hind corner acute, produced. Uropods 1 & 2 rami shorter than peduncle, distally narrowing. Uropod 2, outer ramus distinctly the shorter. Uropod 3 ordinary, inner ramus with 3 marginal spines. Telson elongate linguiform, narrowing to sharply rounded apex; penicillate setae distal.

Distributional ecology. From central British Columbia to southern Oregon, possibly central California, intertidally and immediately subtidal, in algal mats (*Rhodomela*) and *Phyllospadix* clumps, of lotic high salinity waters.

Etymology. A combining form of "nautilus" + "oides" in reference to the overall similarity of this species to *Micropleustes nautilus*.

Taxonomic commentary. *Micropleustes nautiloides* is taxonomically closer to *M. longimanus* than to *M. nautilus* (see Fig. 38, p. 118). *Parapleustes* sp. "A" of Barnard (1969b) may be this species.

Micropleustes behningi (Gurjanova)
(Fig. 36)

Neopleustes behningi Gurjanova, 1938: 315, fig. 30.
Pleustes behningi Gurjanova, 1951: 641, fig. 438.
Parapleustes behningi Barnard & Karaman, 1991: 650 (part).—Ishimaru, 1994: 54 (part?).
Parapleustes behningi Ishimaru, 1984: 407, figs. 3-9.

Diagnosis. (mainly after Gurjanova, 1951). Female (1.5 mm): Body and coxal plates short, deep. Head, eye subquadrate, black. Antennae very short. Antenna 1, peduncular segment 1 stout, length ~ 2X segments 2 & 3 combined; flagellum 8-segmented. Antenna 2 stout, slightly the longer; peduncular segment 4 & 5 very short; flagellum 8-segmented.

Upper lip with narrow epistome; labrum, lobes nearly symmetrical. Lower lip broad, shallow, outer lobes ovate, nearly vertical. Mandible, molar short, apex bluntly rounded; spine row with 7-8 uneven blades, distally thick, proximally short, slender; cutting edge of incisor with 6(?) irregular teeth; left lacinia 7-8 dentate. Maxilla 1, inner plate small, with short apical seta; palp slender, segment 1 lacking shoulder seta; segment 2 slender, with 3? apical spines. Maxilla 2, inner plate small, little broadened distally, with single short inner margin plumose seta Maxilliped, inner plate regular; outer plate short, with 2 curved spines at rounded apex; palp, dactyl stout, slightly longer than segment 3.

Coxae 1-4 relatively deep, narrow. Coxa 1 not expanded distally, hind corner with single stout cusp. Coxa 2, distal margin straight, hind corner with 4-5 distinct cusps. Coxa 4 deeper than broad. Gnathopod 1, carpus short, depth > length; propod medium long, length ~1.5 X depth, palmar margin short, oblique, nearly straight; postero-distal angle with cluster of 3 stout spines; hind margin straight, with distal spine; dactyl strong, minutely setulose behind. Gnathopod 2, somewhat similar, but carpus slightly shorter, hind lobe deeper and narrower than in gnathopod 1; propod more elongate and more slender; length ~ 2X depth.

Peraeopods 3 & 4 slender, margins of segments 4-6 weakly spinose; dactyl strong, > 1/2 segment 6. Peraeopods 5-7 relatively short; bases medium broad, hind margin convex, with 6-8 broad crenulations; segment 4 short, postero-distal process elongate, nearly totally overhanging short segment 5 by 80%; dactyls large.

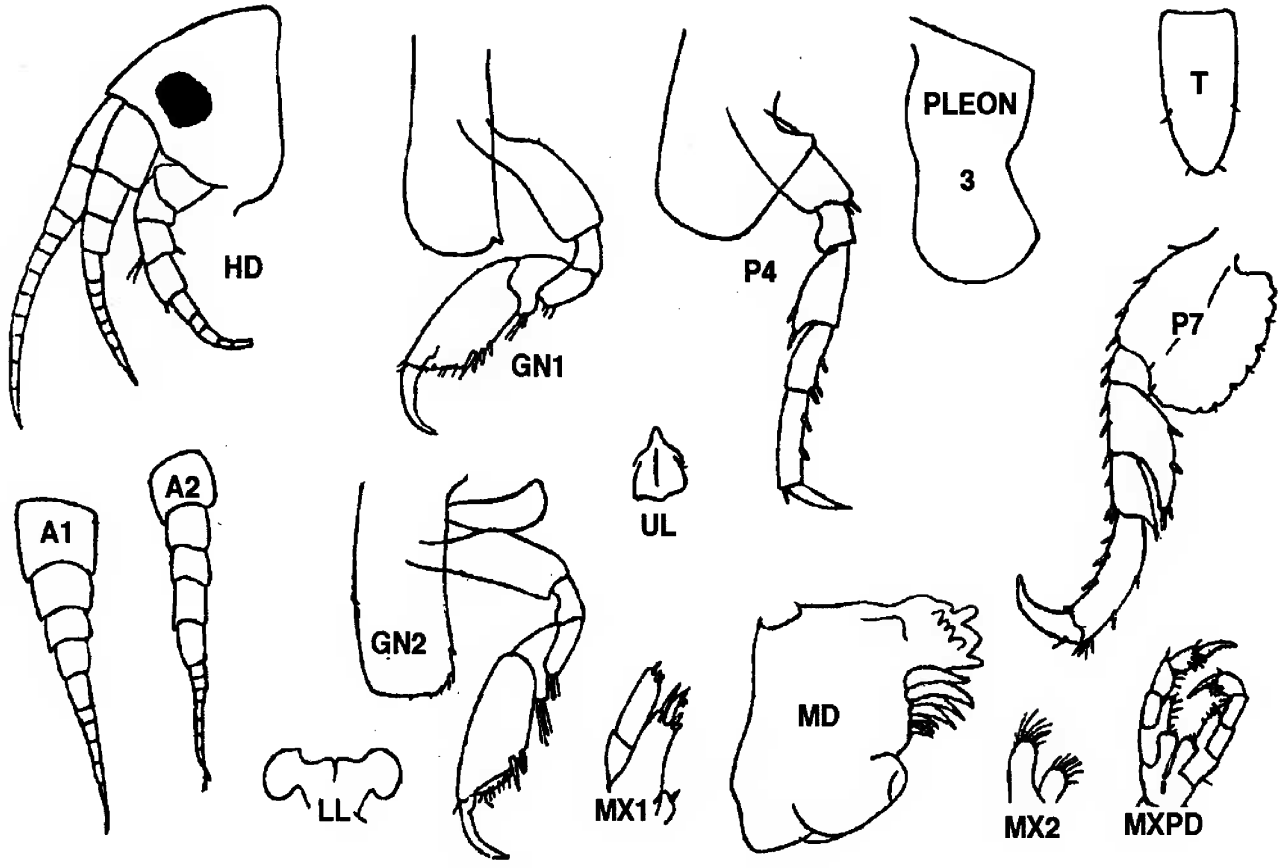

FIG. 36. *Micropleustes behningi* (Gurjanova). Female (4.0 mm). Japan Sea. (after Gurjanova, 1951).

Micropleustes behningioides, new species
(Fig. 37)

Parapleustes behningi Ishimaru, 1984: 407, fig. 4.—Barnard & Karaman, 1991: 650 (part).—Ishimaru, 1994: 54.

Diagnosis. Female (5.9 mm). Body short, compact, coxal plates deep. Head, eye round, medium large. Antenna 1, peduncular segment 1 short < 2 & 3 combined; flagellum long, relatively stout, 19-segmented. Antenna 2 shorter, peduncular segments 4 & 5 short, subequal; flagellum 16-segmented.

Upper lip regular, lobes slightly asymmetrical. Lower lip inner lobes, deep, outer lobes large, oblique. Mandible, molar prominent, slender, apex subacute; spine row with 9 short stout blades; cutting edge of incisor with 8 unequal teeth; palp segment 3 with short, proximal "A" seta, and 10? inner marginal pectinate "D" spines; left lacinia with 7(?) teeth. Maxilla 1, inner plate with single apical plumose seta; palp segment 1 with 2 "shoulder" setae; segment 2, surface finely setulose, apically with 4-5 short spines. Maxilla 2, inner plate short, broadly expanded, inner margin with 2 unequal plumose setae. Maxilliped, inner plate medium, with few distal facial setae, and 4 apical marginal spines; outer plate short, apex narrowly rounded, with 2 slender spines; palp, dactyl stout, nearly straight, not longer than segment 3.

Coxa 1-3 medium broad, deep. Coxa 1 slightly broadened distally, hind corner with 1-2 minute cusps. Coxae 2 & 3, hind corner with 3 minute cusps. Coxa 4 deeper than broad. Coxa 5 lobes deep. Gnathopod 1, carpus short, deep, hind lobe narrow; propod short, length ~1.5X width; palmar margin relatively long, about equal to posterior margin, convex, oblique, postero-distal angle with 3 spines; dactyl minutely setulose behind. Gnathopod 2 subsimilar; carpus slightly shorter and deeper; propod slightly expanding distally.

Peraeopods 3 & 4 stout, 3 distinctly the larger; segment 4 broadened abruptly, with subparallel margins; dactyls medium strong. Peraeopods 5-7 short, subsimilar; bases moderately expanded, hind margins gently convex, minutely crenulate; hind lobes deep; segment 4 broadened, nearly as wide as deep, postero-distal lobe 2/3 overhanging short segment 5; dactyls stout.

Pleon plate 2 , hind corner rounded; pleon plate 3 hind corner acuminate. Uropods 1 & 2 short, little or not exceeding uropod 3. Uropod 1, rami and peduncle subequal in length. Uropod 2, outer ramus distinctly the shorter. Uropod 3, outer ramus shorter, length barely 1/ inner ramus.

Telson slender, "pinched" medially, narrowing to rounded apex; penicillate setae distal.

Etymology. A combining form of the species name "*behningi* " and the suffix "*oides* ", like the regionally co-occurring species *M. behningi* (Gurjanova, 1938).

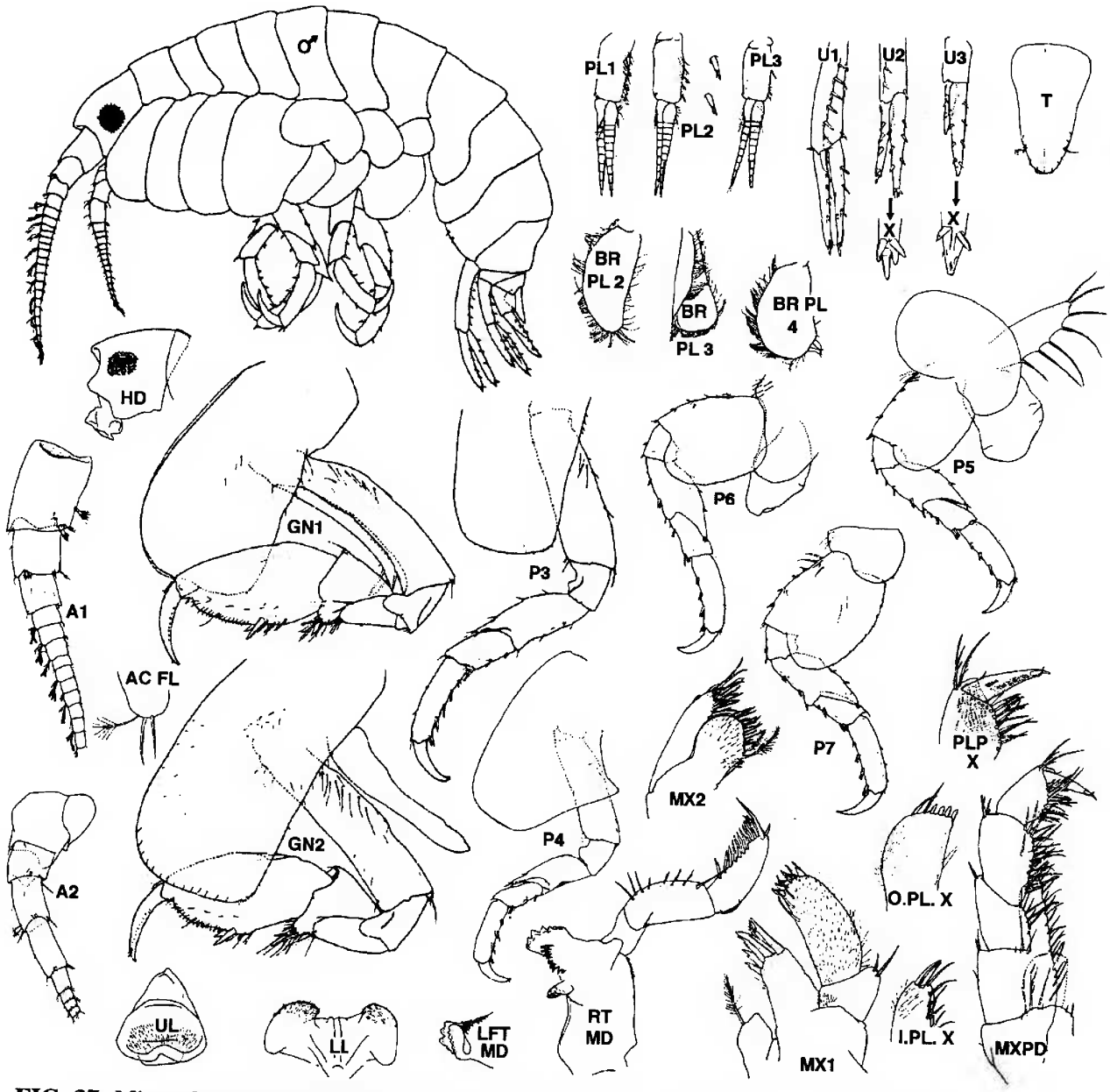

FIG. 37. ***Micropleustes behningioides*****, new species. Female (5.9 mm); male (4.0 mm). Japan Sea. (after Ishimaru, 1984).**

Pleon plate 3 strongly convex below, hind corner obtuse. Uropods 1-3 regular. Telson elongate, narrow, apex sharply rounded; penicillate setae nearly median.

Type material. Ishimaru, 1984, figs. 3-7: Female "a" (5.9 mm), **Holotype**, Samani, Hokkaido; Ibid., fig. 8: Male "e" (4.0 mm), **Allotype**, Oshoro, Hokkaido. Collections of the Faculty of Science, Hokkaido University.

Distribution. Eastern Sea of Japan and southern Hokkaido, among *Phyllospadix* and *Sargassum*, LW-0.5 m depth.

Taxonomic commentary. *Micropleustes behningioides* is readily separable from *M. behningi* (Gurjanova, 1938), and appears morphologically closer to *M. nautilus* (see key, p. 113; also fig. 34, p. 112).

Micropleustes longimanus (Ishimaru)
(Fig. 38)

Parapleustes longimanus Ishimaru, 1984: 438, figs. 25-28. —Barnard & Karaman, 1991: 650.—Ishimaru, 1994: 54.

Diagnosis. Female (2. 9 mm): Body short, compact, coxal plates medium deep. Antennae short, slender, subequal. Antenna 1, peduncular segment 1 short, length < segments 2 & 3 combined; accessory flagellum broadly conical, with 4 apical setae; flagellum 8-segmented. Antenna 2, peduncular segments 4 & 5 slender, subequal; flagellum 8-segmented.

Upper lip shallowly V-cleft apically, lobes nearly symmetrical. Lower lip, inner lobes deep, outer lobes small ovate, oblique. Mandible, molar process, short, conical;

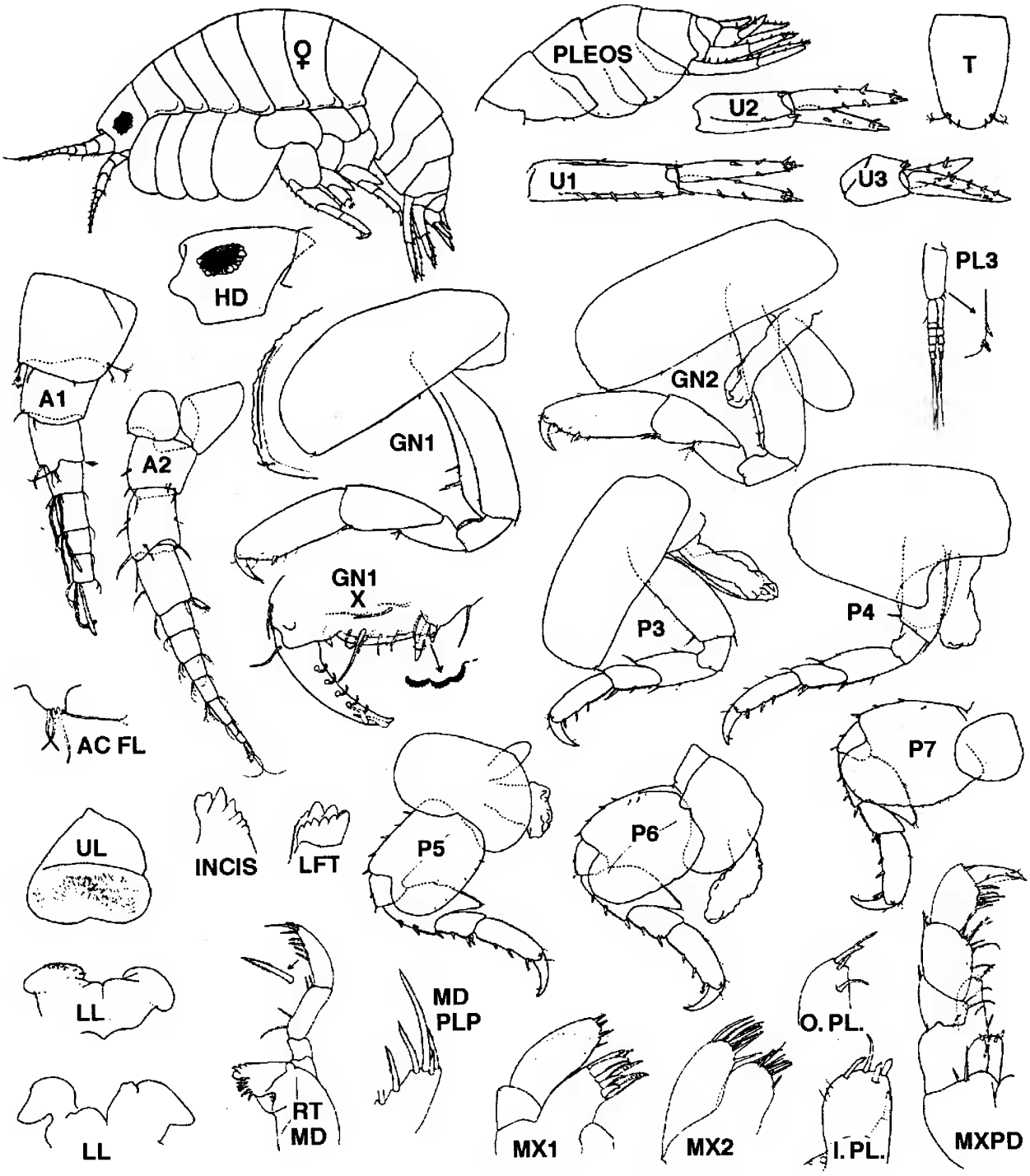

FIG. 38. ***Micropleustes longimanus*** **(Ishimaru). Female (2.9 mm). Japan. (after Ishimaru, 1984).**

spine row with 6-7 short blades; cutting edge of incisor with 6-7 unequal teeth; palp segment 3 with 5 inner marginal pectinate "D" spines; left lacinia 6-7-dentate. Maxilla 1, inner plate small, lacking apical seta; palp segment 1 lacking "shoulder" seta; segment 2 narrowing distally, apex with 3-4 slender spines. Maxilla 2, inner plate slightly shorter than outer plate, little broadened, with 1 short inner marginal plumose seta. Maxilliped, inner plate very short, with 1 inner marginal stout seta, apex with 2 stout and 2 slender spines; outer plate very short, subtruncate apex with 2 slender spines; palp, dactyl curved shorter than segment 3.

Coxae 1-4, lower margins rounded. Coxa 1 slender, hind corner with single small cusp. Coxae 2-3, lower border minutely crenulate, hind corner with single cusp. Coxa 4 deeper than wide. Coxa 5, lobes deep. Gnathopod 1, carpus slender, hind lobe very small, length ~2X depth; propods

slender, length ~3X depth, margins subparallel, palmar margin very oblique, very short, postero-distal angle with single cluster of 3 spines (one large); dactyl short, inner margin with 5 short curved setules. Gnathopod 2 subsimilar, except carpus and propod slightly shorter and deeper.

Peraeopods 3 & 4, segments 4-6 relatively stout, 4 not broadened; dactyl medium. Peraeopods 5-7 very short, closely subsimilar; bases broad, lower hind lobes very deep, hind margins gently convex; segment 4 expanded, broader than deep, postero-distal lobe nearly totally overhanging short segment 5; segment 6 stout, with 2 anterior marginal spines; dactyl medium.

Pleon plate 3, hind corner squared. Pleopods, peduncles stout, outer margins short-spinose; rami short, 12-segmented. Uropods 1 & 2 slightly exceeding uropod 3. Uropod 1, rami subequal weakly marginally spinose. Uropod 2, outer ramus slightly the shorter. Uropod 3, outer ramus short, length ~60% inner ramus. Telson short, slightly narrowing distally to broadly rounded apex; penicillate setae marginally subapical.

Distribution. The species is known from inshore shallows of the mainland and Japanese coast of the Sea of Japan.

Taxonomic commentary. *Micropleustes longimanus* is distinctive in nearly every character state, but in balance appears closest to *M. nautiloides* of the North American Pacific region.

Dactylopleustinae, Bousfield & Hendrycks

Dactylopleustinae Bousfield & Hendrycks, 1994: 38.

Type Genus. *Dactylopleustes* Karaman & Barnard, 1979, monotypy.

Diagnosis. A monotypic group of primitive but secondarily specialized commensal and/or parasitic pleustids.

Rostrum short. Eyes large, reniform. Antennae short, pediform. Accessory flagellum minute.

Upper lip, notch shallow, lobes only slightly asymmetrical. Lower lip with deep, distinct inner lobes. Mandible, molar rounded, non-triurating; palp segment 2 short, segment 3 swollen, lacking baso-facial ("A") setae ; right lacinia lacking; Maxilla 1, outer plate short, wide, with 9-16 pectinate spine-teeth; inner plate with 1 apical seta; palp large, terminal segment broad. Maxilla 2, plates short, subequal. Maxilliped, plates small, weakly armed; palp segments short; dactyl pectinate.

Coxae 1-4 deep, 1 shortest. Gnathopods with elongate carpus and propod, longer in gnathopod 2; palmar margins short, lacking median tooth, hind margin setose.

Peraeopods 3-7 short; dactyls short, inner margins finely crenulate or pectinate. Peraeopods 5-7 basically homopodous; coxae regularly and strongly postero-lobate; bases broad.

Pleon plates regular, unmodified. Urosome 2 not occluded dorsally. Uropods 1 & 2 broad-lanceolate, rami subequal, broad-lanceolate. Uropod 3 medium, rami unequal. Telson keel proximally.

Coxal gills saclike on peraeopods 2-4, plate-like on 5 & 6.

Taxonomic commentary. This monotypic group (consisting to date of three species in one genus) was formerly assigned to the genus *Parapleustes* based on the non-triturating molar and ordinary form of the maxillipedal palp. However, the unusual mixture of plesiomorphic and apomorphic character states justified elevation of the genus *Dactylopleustes* to subfamily ranking (Bousfield & Hendrycks, 1994).

Dactylopleustes Karaman & Barnard

Parapleustes Tzvetkova 1975: 121 (part).
Dactylopleustes Karaman & Barnard, 1979: 112.—Barnard & Karaman, 1991: 647.

Type species. *Parapleustes echinoicus* Tzvetkova, 1975, original designation

Species. *Dactylopleustes echinoides*, new species (p. 121); *D. (Apodactylopleustes) obsolescens* Hirayama, 1988.

Diagnosis. Body small, smooth above, lysianassiform; coxae deep, legs short. Head, rostrum short, about equal to broadly rounded anterior head lobe; inferior antennal sinus shallow. Antenna 1 not longer than antenna 2, segment 2 short, segment 3 very short, flagellum shorter than peduncle; Antenna 2, flagellum shorter than peduncle.

Mouthparts highly modified. Lower lip, inner lobes tall, outer lobes large, oblique to nearly horizontal. Mandible, molar forming a smoothly rounded protuberance beneath 6-8 slender blades; left lacinia with 6-7 rounded teeth; palp slender; segment 1 short, segment 2 weakly setose; segment 3 with few pectinate inner marginal setae. Maxilla 1, outer plate short, broad, apical spines slender, innermost strongest. Maxilla 2, outer plate with heavy spinelike apical setae. Maxilliped, plates weakly armed; inner plate lacking distal "button" spines, outer plate, inner margin concave, apex weakly spined; palp short, segment 2 shortest, segment 3 longest, with medio-distal row of spines; dactyl slender.

Coxal plates 1-4 very deep, broad, much deeper than body plates; coxa 1 distinctly smallest, but not expanded distally; hind cusps 2-5 per plate, small. Gnathopods small, short, subequal, subsimilar, non sexually dimorphic; bases slender, anterior margin setose (more strongly in Gnathopod 1); merus rounded distally; carpus shallow-setose behind, length about equal to propod; palm very short, convex, with few short spines at postero-distal angle, long hind margin with groups of pectinate setae; dactyl short, smooth.

Peraeopods 3-7 short, segmental margins short-spinose; dactyls very short, body heavy, inner margin nearly straight, micro-crenulated. Peraeopods 5-7 regularly homopodous, coxae very deep, hind lobes rounded below; bases broad,

KEY TO SPECIES OF *DACTYLOPLEUSTES*

1. Eyes large, deep, reniform; mandibular palp, segment 2 distinctly longer than segment 1; coxa 1 distinctly shorter than coxa 2; telson elongate; uropods 1 & 2 not modified ..... 2.
—Eyes medium, ovate, few large facets; mandibular palp slender, segment 2 little longer than 1; coxa 1 slightly shorter than coxa 2; uropods 1 & 2 (male), inner ramus short, broad, weakly armed ..... *D. (Apodactylopleustes) obsolescens* (p. 123)

2. Maxilla 1, outer plate with 9 apical spine teeth; peraeopod 5, basis with angular postero-distal lobe; mandibular palp, segment 3 broad, with 7 inner marginal pectinate setae; maxilliped palp, segment 2 subequal to 1, dactyl thick, tip pectinate; gnathopod bases nearly bare of setae . *D. echinoicus* (p. 120)
—Maxilla 1, outer plate with 15 slender apical spine-teeth; peraeopod 5, basis smoothly rounded behind; mandibular palp, segment 3 slender, with 5 inner marginal setae; maxilliped palp, segment 3 shorter than either 1 or 3, dactyl slender, acute, not conspicuously pectinate; gnathopods 1 & 2, basis strongly setose anteriorly ..... *D. (Neodactylopleustes) echinoides* (p. 121)

---

evenly rounded behind.

Pleon side plates medium deep, broad, smooth below, hind corners acuminate. Pleopod peduncles short, rami with reduced numbers of segments, not sexually dimorphic. Uropods 1 & 2 short, stout; rami suramceolate, margins serially spinose, tips not spinose. Uropod 3, peduncle short, stout, rami broad-lanceolate, inner ramus distinctly the larger.

Coxal gills largest on peraeopods 4 & 5, smallest on peraeopod 6.

Taxonomic commentary. The three component species of the genus are sufficiently distinct to justify separate generic status. Although Hirayama (1988) recognizes *D. obscolescens* as a distinct subgenus, *Apodactylopleustes* (see key above), further subdivision must await analysis of more extensive material in which new taxa are anticipated.

Dactylopleustes echinoicus (Tzvetkova)
(Fig. 39)

Parapleustes echinoicus Tzvetkova, 1975:122, fig, 1.
Dactylopleustes echinoicus Karaman & Barnard, 1979: 112.—Barnard & Karaman, 1991: 647. .

Diagnosis. Female (5.0 mm): Head, rostrum small, shorter than lateral lobes. Eyes moderate, reniform, black. Antennae short, 1<2; segments of the peduncle and flagellum shortened and broad. Flagellum of antenna 1 of 8 segments, of antenna 2 of 5 segments.

Upper lip, lobes slightly asymmetrical. Mandible, spine row with 12 slender short blades; incisor 7-dentate; palp strong; segment 3 longest, with 7 inner marginal pectinate "D" spines. Maxilla 1, palp segment 2 with 5 apical spines, segment 1 lacking shoulder seta. Maxilla 2, plates subequal Maxilliped, inner plate with 3 apical button spines; outer plate short, with stout apical spine snd slender seta; palp segment 3 slender, dactyl short, broad, with apical inner marginal pectinations.

Coxal plates 1 and 2 rectangular, lower margin convex, hind corner with 2 cusps. Coxal plate 4 deeper than broad. Gnathopod 1 weakly subchelate; basis slender, bare; carpus and propod slender, subequal; hind margin of propod with 3 groups of setae. Gnathopod 2 , segment 5 lacking hind lobe, segment 6, hind margin strongly setose, palm very short, oblique, dactyl short.

Pereopods 3 & 4, segment 5 < 4, hind margins with short spines; dactyl short, body with 5-6 prominent posterior pectinations, unguis slender, curved. Peraopods 5-7, coxae relatively deep; bases expanded to different degrees, 5 sharply angled behind, 7 very broad, rounded, smooth behind; segment 5 shorter than 4; dactyls with small marginal pectinations.

Pleon plates 1-3, hind corner slightly acuminate. Uropod 3 stout, rami broad; inner ramus almost equal to peduncle slightly longer than half outer ramus; outer margin of the outer ramus bare, inner margin with 4 spines.

Telson short almost parallel-sided; apex rounded, unarmed.

Distributional ecology. Known only from Bering Island (Commander Islands, off the east coast of Kamchatka), reef south of Nikol'skoye village.

D. echinoicus is an obligate symbiont of the sea urchin *Strongylocentrotus polyacanthus*. The peraeopod dactyls are modified for holding the crustacean onto the body of the sea urchin, as if "wedged in", and to move around the movable spines on the surface of the test.

Taxonomic commentary. *Dactylopleustes echinoicus* is phyletically more primitive than the other two species of the genus subsequently described from Asiatic and North American coast (pp. below). The dactyls of this genus are adaptive to a lifestyle of clinging to the spines and surfaces of sea urchin tests. A less sophisticated form of grasping dactyl was noted in *Commensipleustes commensalis* (Shoemaker) (p. 82). In that species, the dactyl and expanded spinose propod of peraeopods 3-7 form a subchelate claw-like mechanism that enables the amphipod to cling to the pleopods of the spiny lobster *Panulirus interruptus*. Such morphological specializations underscore the high degree of adaptive radiation within subfamily Parapleustinae that is associated with a commensal lifestyle.

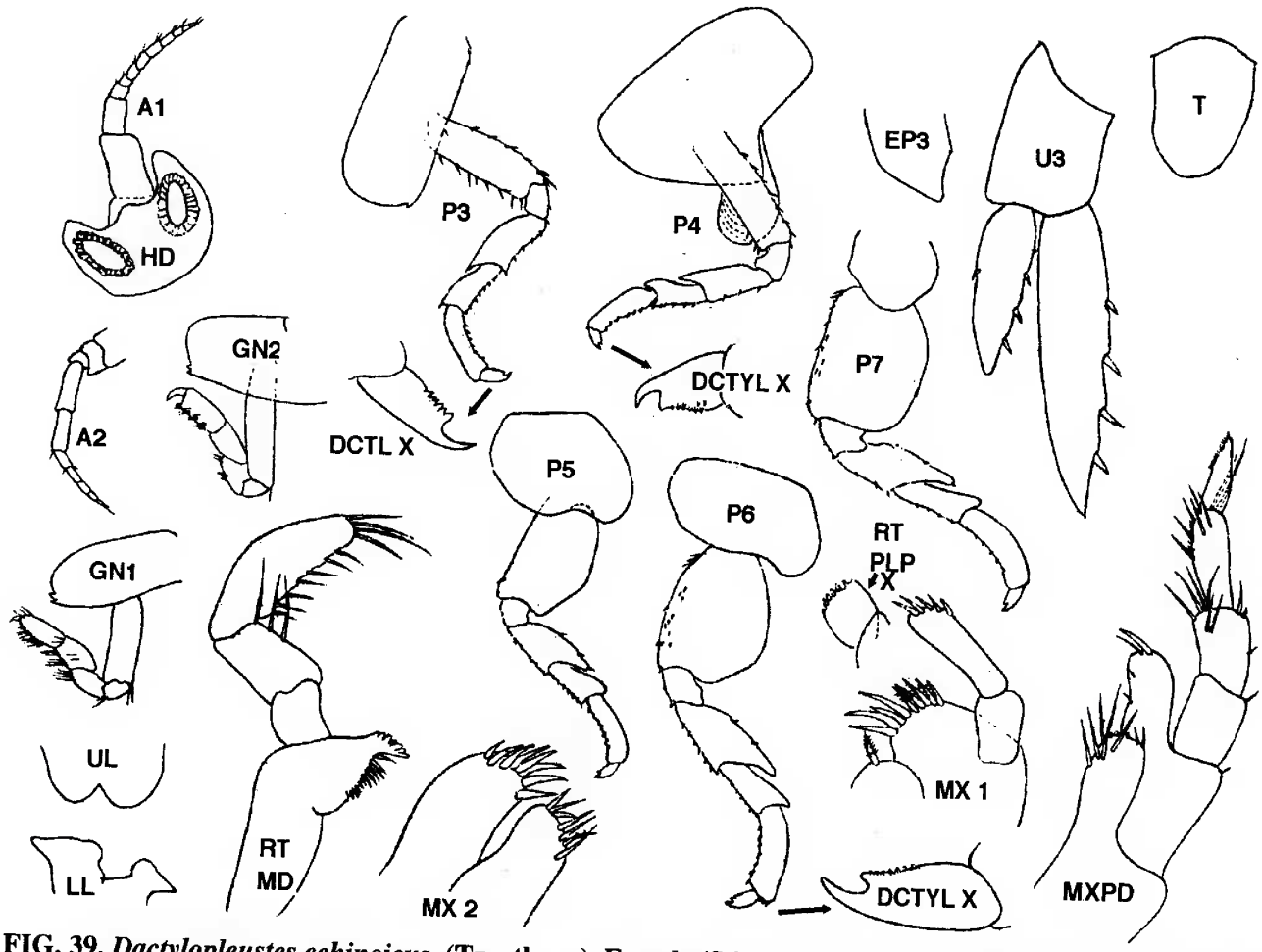

FIG. 39. ***Dactylopleustes echinoicus*** **(Tzvetkova). Female (5.0 mm). Bering Sea. (after Tzvetkova, 1975)**

Dactylopleustes echinoides , new species
(Fig. 40)

Dactylopleustes echinoicus Austin, 1985: 592?—Barnard & Karaman, 1991: 647 (part)?.

Material examined.
BRITISH COLUMBIA.
Northern Vancouver I.: ELB Stn. N16, Port Neville, Johnstone Strait., in clumps of *Phyllospadix* and under algal mats, LW level, July 17, 1959 - Female ov (3.3 mm), **Holotype** (s lide mount), CMN Cat. no. NMC1995-0079; 3 females, 1 male, **Paratypes,** CMN Catalogue no. NMCC-1995-0080.

Diagnosis. Female ov (3. 3 mm): Head, rostrum as long as lateral head lobe. Eye deep reniform, black. Antenna very short. Antenna 1 peduncle 3 not larger than basal flagellar segment, flagellum 5-segmented. Antenna 2, flagellum 5-segmented.

Upper lip, median notch sharp, shallow, lobes nearly equal. Lower lip, inner lobe deep, narrow, outer lobes large nearly horizontal. Mandible molar large, broadly rounded; spine row with 7 slender blades; incisor 8-dentate; left lacinia 8-9 dentate; palp segment 2 relatively long; segment 3 with 4 inner marginal pectinate "D" spines. Maxilla 1, outer plate with 14 long slender distally curved apical spines; palp broad, with 6 stout apical spines. Maxilla 2, plates short, broad, outer plate with 12 heavy apical spines. Maxilliped inner plate short, apex sloping inward, with 3 minute button spines; outer plate slender, inner margin excavate, apex with 1 heavy spine and 2 setae; palp segment 2 short, 3 with pectinations near base of thin pectinate dactyl.

Coxa 1 distinctly shorter than 2, hind corner with 4 cusps; coxa 2 & 3 with 3 and 2 hind cusps respectively. Coxa 4 very large, subrectangular, deeper than broad. Gnathopod 1, basis, anterior margin strongly setose; propod much shorter and more slender than carpus, with 1 stout distal facial cluster of setae; palm very short, oblique, overhung by stout dactyl. Gnathopod 2, basis less strongly setae; carpus longer, propod subrectangular, palm distinct, strongly convex, nearly vertical, hind margin with 3 setal clusters.

Peraeopods 3 & 4, margins of bases lined with short setae; dactyls short, stout, inner margins with 10+ minute pectinations. Peraeopods 5-7 closely homopodous, bases broadly rounded behind; segment 4 widening distally; segment 5 short; dactyls short, finely pectinate. Coxa 6 deep behind.

Pleon plate 3, hind corner produced, acuminate. Uropod 1 & 2 stout, rami basal broadly nearly as long as peduncle, margins strongly spinose. Uropod 3, inner ramus heavy,

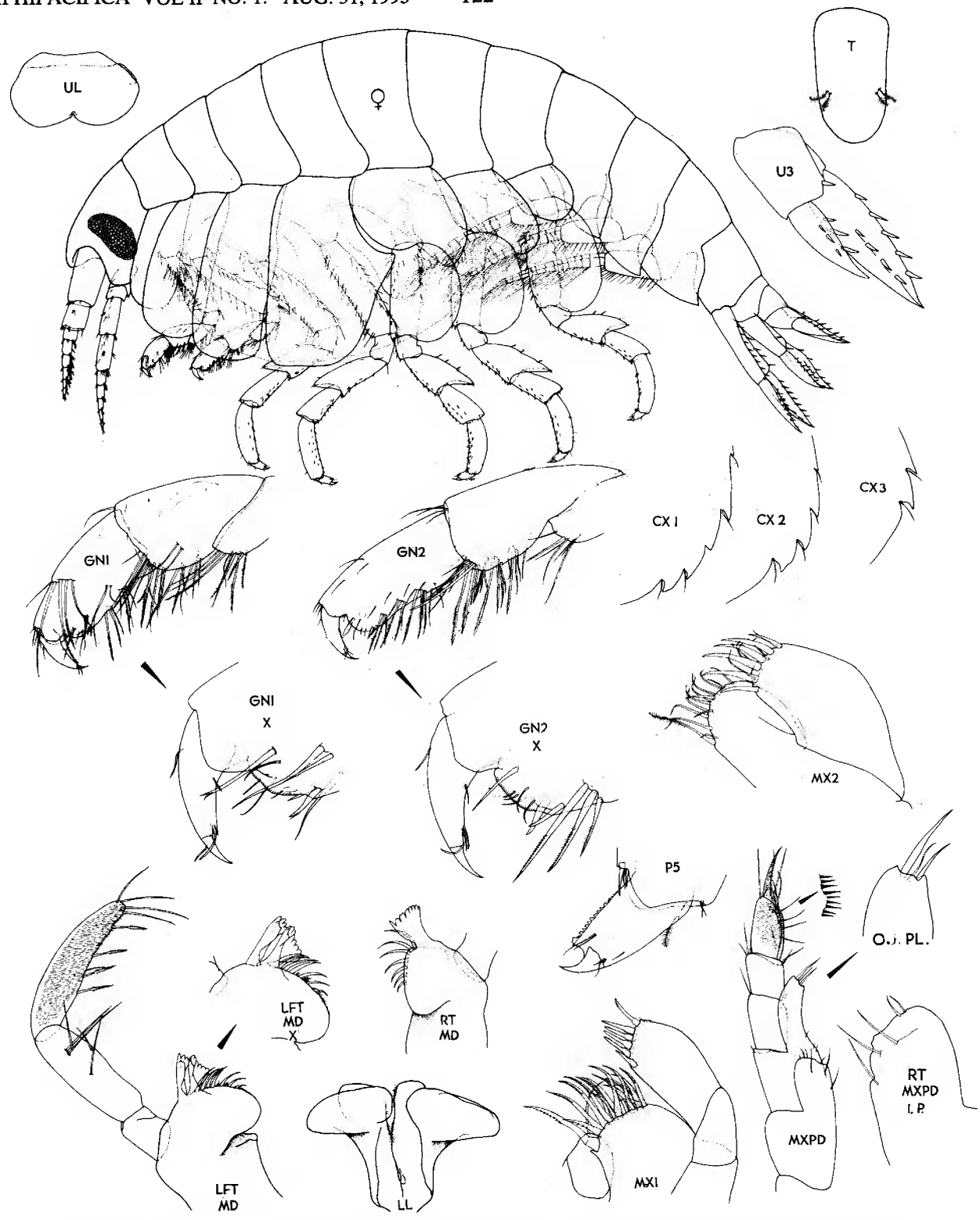

FIG. 40. ***Dactylopleustes echinoides*** **, new species. Female (3. 3 mm). Port Neville, B. C.**

thick, margins with 4-5 spines; outer ramus with 3 spines on each margin.

Telson relatively long, length 2X width, apex smoothly rounding.

Etymology. Combining the suffix "oides" - like, or similar to, the type species *D. echinoicus.*

Taxonomic & distributional commentary. The host echinoid has not been determined precisely. However, the sea urchin *Strongyocentrotus purpuratus* occurred commonly at the type locality . The echinoid fauna of the region is diverse (Ricketts & Calvin, 1968) and would indicate that several other host-specific species of *Dactylopleustes* may yet be discovered in the North American Pacific region.

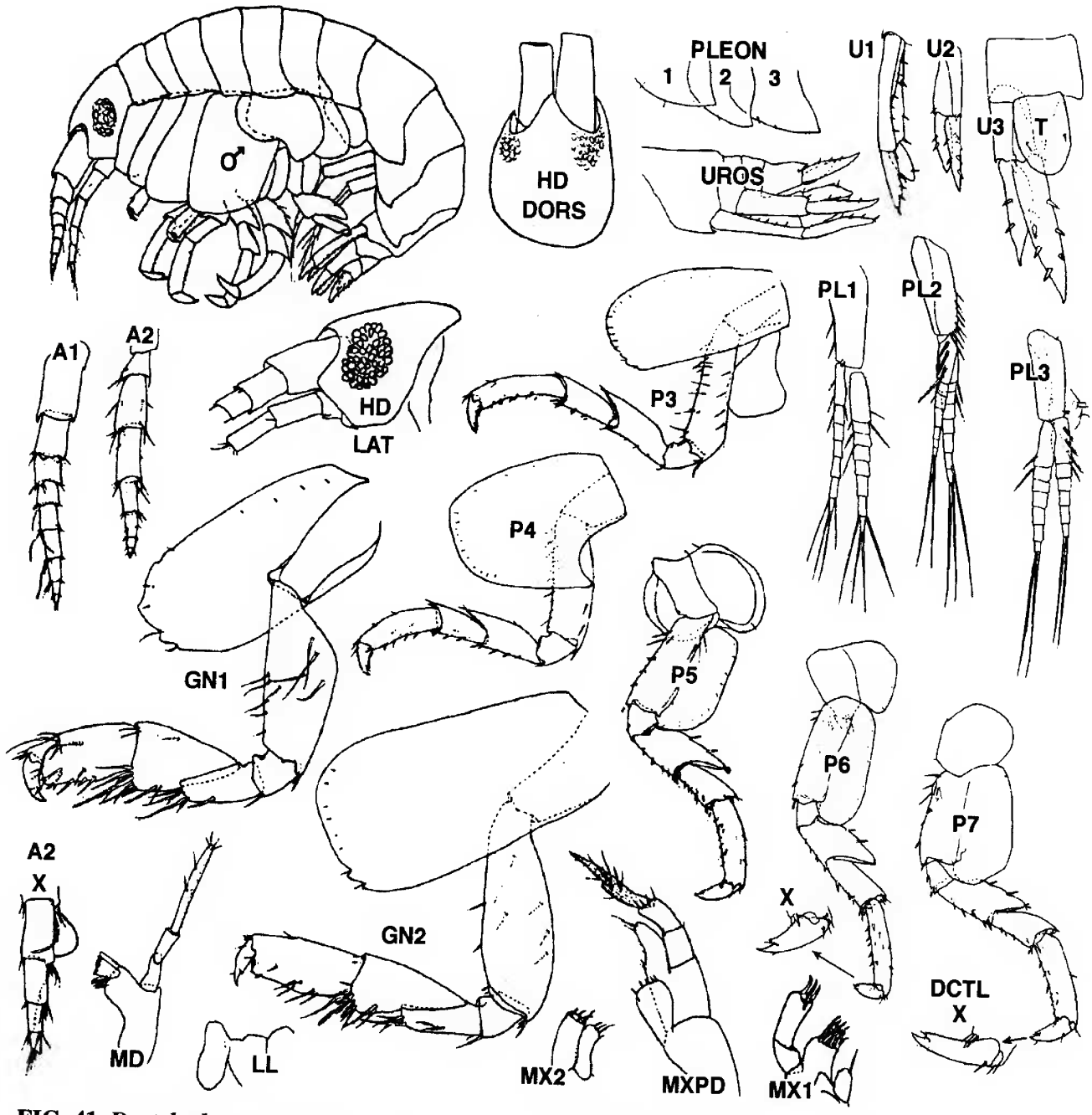

FIG. 41. ***Dactylopleustes obsolescens*** **Hirayama. Male (2.0 mm). Ariake Sea. (after Hirayama, 1988).**

Dactylopleustes obsolescens Hirayama
(Fig. 41)

Dactylopleustes (Apodactylopleustes) obsolescens, Hirayama, 1988: 44, figs. 269-271.—Ishimaru, 1994: 54.

Diagnosis. Male? (2.0 mm): head, rostrum equal to lateral head lobes. Eye oval, large, orange. Antennae relatively long. Antenna 1, peduncular segment 3 larger than adjacent flagellar segment; flagellum 6-segmented. Antenna 2, peduncular segments 4 & 5 slender, subequal; flagellum 5-segmented.

Lower lip, outer lobes nearly vertical. Mandible, molar process evanescent spine row with 5 short blades; incisor 7-8 dentate; left lacinia 8-9 dentate; palp segment 2 very short; segment 3 long and slender with 1-2 inner marginal pectinate "D" spines. Maxilla 1, outer plate with 11 apical spines; palp, terminal segment apically truncate, with 5 spines. Maxilla 2, outer plate much the stouter, with 3-5 apical spines. Maxilliped, inner plate apically truncate, lacking button spines; outer plate slender, inner margin excavate; palp segment 2 short, distally pectinate, dactyl pectinate.

Coxa 1 not noticeably shorter than 2, hind corner with 2 cusps. Coxae 2-3 with 2-3 hind cusps. Coxa 4 relatively broad, hind process curved upwards. Gnathopod 1, basis weakly setose; carpus stronger than propod, dactyl stout,

overhanging short, vertical palm. Gnathopod 2, basis nearly bare; propod rectangular, slightly longer than carpus, dactyl overhanging short vertical palm, hind margin with 2 groups of setae.

Peraeopods 3 & 4, hind margins of segment 4-6 with regular spines, dactyl finely pectinate behind. Peraeopods 5-7 irregularly homopodous, bases unevenly expanded, hind margins nearly straight, 6 relatively narrow, 7 broadest, hind lobes deep; segment 4 broad; segment 5 short, 6 relatively long; dactyls thick, anterior margins very finely pectinate.

Pleon plate 3 hind corner strongly produced acuminate. Uropods relatively stout, rami short, broad, especially outer ramus, much shorter than peduncle, margins weakly spinose. Uropod 3, inner ramus, margins each with 3 spines; outer ramus, our margin with 2 pines, inner margin bar. Telson medium short, length 1.7 X width, apex evenly rounded.

Distribution. Ariake Sea (1 specimen only).

Taxonomic commentary. *Dactylopleustes obsolescens* is clearly distinct from *echinoicus*, but more closely similar to *echinoides*. It is distinctive in the unlike form of peraeopods 5-7, the short, weakly armed uropods, and the very elongate mandibular palp segment 3.

Pleusirinae Bousfield & Hendrycks, 1994

Pleustidae Gurjanova 1972: 135, 138 (key) (part).—Barnard & Karaman, 1991: 649.
Pleusirinae Bousfield & Hendrycks, 1994: 40.

Type genus. *Pleusirus* Barnard, 1969b, original description.

Diagnosis. Body small, slender, dorsally smooth; urosome 2 occluded dorsally. Head, rostrum short, deflexed, anterior head lobe broadly rounded. Eye rounded. Antennae slender, medium, antenna 1 the longer. Antenna 1, peduncles 2 & 3 short; accessory flagellum minute, apex setose; antenna 2, peduncle medium strong.

Mouthparts strongly modified. Upper lip broad, lobes asymmetrical. Lower lip, inner lobes deep, narrow. Mandible, molar reduced to a large smooth lobe; spine row short, blades short; left lacinia multi-dentate (9-10); right lacinia lacking; palp slender, segment 2 longest; segment 3 shorter, lacking baso-facial seta; segment 1 elongate. Maxilla 1, inner plate small, bare; outer plate with 9 apical spines; palp slender, facially pilose, apex weakly armed. Maxilla 2, plates small, weakly setose-spinose. Maxilliped, inner plate short, with few apical and inner marginal spines; outer plate narrow, columnar; palp large, subcheliform; segment 3 widest medially, not produced beyond base of slender dactyl.

Coxal plates 1-4 increasing in size posteriorly, rounded below, lacking hind cusps. Gnathopods 1 & 2 slender, subequal, "eusiroidean" in form, not sexually dimorphic; carpus elongate, hind lobe shallow; propod subovate, palm long, lacking median tooth; posterior angle with 2 spine clusters.

Peraeopods 3-7 slender; dactyls short. Peraeopods 5-7 closely homopodous in size and form; bases broad, rounded behind; segment 4 little overhanging segment 5 behind.

Pleon plates 1-3, hind corners acuminate. Pleopods strong, not sexually dimorphic. Uropods 1-3 slender, rami elongate, spinose. Telson elongate, keeled proximally, pemicillate setae median.

Coxal gills narrow, saclike on peraeopods 2 & 3, platelike on peraeopods 4-6, increasing posteriorly.

Taxonomic commentary. The subfamily appears allied with the subfamily Parapleustinae in most character states, especially of the mouthparts. It is unique in the eusiroidean form of the gnathopods, the generally reduced form of maxillae 1 & 2, the inflated, distally smooth mandibular molar; elongate mandibular palp segment 1; and the semi-subchelate form of the maxilliped palp.

Pleusirus J. L. Barnard

Pleusirus J. L. Barnard, 1969b: 204.—Gurjanova, 1972: 135.—Barnard & Karaman, 1991: 649.

Type species. *Pleusirus secorrus* Barnard, 1969b: 204.

Subspecies. *Pleusirus secorrus asiaticus* Kudrjaschov & Tzvetkova, 1975, original designation.

Diagnosis. With the characters of the subfamily, and in addition: Antenna 1, peduncular segment 1 with postero-distal process; flagellar segments, posterior marginal aesthetascs paired, prominent.

Mandibular blades thick, distally pectinate; incisor 7-8-dentate, third tooth largest. Maxilla 1, palp segment 1 with "shoulder" seta. Maxilla 2, inner plate not broadened, lacking inner marginal plumose seta. Maxilliped, inner plate with stout inner marginal and apical spines.

Gnathopods 1 & 2, bases slender, margins not strongly setose; propod, hind margin smooth; dactyl slender.

Peraeopods 5-7, coxae deep, postero-lobate, hind lobes rounded, segment 5 not longer than 4.

Uropods 1 & 2, inner ramus longer than peduncle. Uropods 2 & 3, outer ramus short. Telson rounded, penicillate setae median.

Male: Antennal segments with prominent aesthetascs; peraeopods 5-7 relatively slender; dactyls relatively long, slender, nearly straight.

Taxonomic and distributional commentary. The genus encompasses two forms, one a subspecies of the other, one on the Asiatic and the other on the North American Pacific coast.

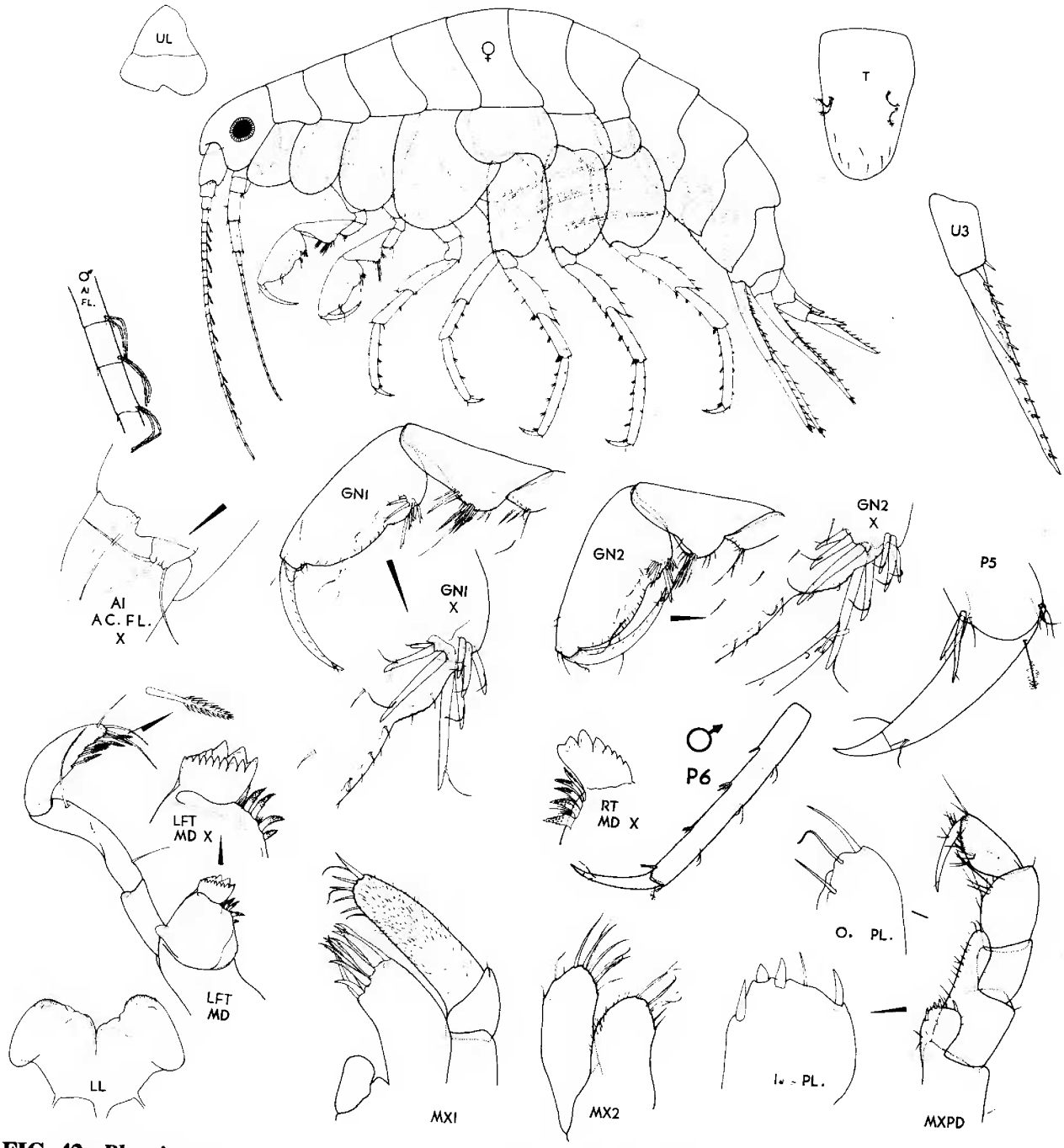

FIG. 42. *Pleusirus secorrus* Barnard. Female (3.7 mm); male (2.1 mm). Wickaninnish Bay, B.C.

Pleusirus secorrus J. L. Barnard
(Fig. 42)

Pleusirus secorrus J. L. Barnard, 1969b: 204, fig. 56.—Gurjanova, 1972: 135, 138 (key).—Austin, 1985: 592.—Staude, 1987: 379.—Barnard & Karaman, 1991: 650.

Material examined.

ALASKA. 46 specimens (all females, a few subadults) from 18 localities, as follows:

Southeastern Alaska: ELB Stns., June-July, 1961: A3 (8); A6 (12); A8 (1); A48 (1); A75 (3); A80(7); A81 (1); A92 (6); A125 (1); A129 (1); A131 (5); A139 (2); A147 (4); A151(2); A164 (3); A168 (1); A171 (4); A175 (7).

BRITISH COLUMBIA. 252 specimens (including 1 male?) at 59 localities, as follows:

Queen Charlotte Islands. ELB Stns., July-Aug., 1957: H14 (2); W4a (2); W4b (3); E5 (1); E25 (1); W8 (7); W9 (1); W11 (7); W12a (3).

Northcentral coast. ELB Stns., July, 1964: H1 (15); H3 (2); H5 (30); H7 (12); H8 (2); H10 (2); H12 (8); H26 (5); H 23 (1)H29 (1); H30 (10); H47 (1); H48 (2); H50 (3); H53 (20+); H57 (1); H65 (6). ELB Stn., 1959: N22 (2).

Vancouver Island, north end: ELB Stns., July, 1959: O1 (1); O5 (3); O11 (3); O13 (7); O15 (7); V5 (2); V7 (3); V11 (1); V17 (2); V18 (1); N 11 (1); N16 (1).
Vancouver Island, south end: ELB Stns., July-Aug., 1955: F1 (6); F4 (1); P2 (1); P7 (1). ELB Stns., 1970: P715 (1); P716 (2); P718 (13); P719 (1). ELB Stns., 1975: P5b (2); P5c (1); (20 (4). ELB Stns., 1976: B3 (2); B4 (2); B5 (1); B7 (10). ELB Stns., 1977: B7a ((8); B11b (1); B14 (1); B19b (2); B21b (3). ELB Stn. O15, Box I., Wickaninnish Bay, *in Phyllospadix* clumps, algal mats, over bedrock, LW level, Aug. 16, 1959 - female ov (3.7 mm) (slide mount) (fig'd specimen) + 7 other females.
Duncan Bay, Middle Pt., barge, 3-4 m dive, *Ulva* & bryozoans, P. Shaw coll., Seot 5, 1987 - 1 male (fig'd) + 6 specimens.

WASHINGTON-OREGON. 22 specimens at 3 localities, as follows:
Coastal localities: ELB Stns, July-Aug., 1966: W40 (18); W42 (2); W58 (2).

Diagnosis. With the characters of the genus and subfamily. The subspecies *asiaticus* Khudrjaschov & Tzvetkova, 1975, may prove to be morphologically, if not ecologically, distinct, but western Pacific material was not re-examined in this study.

Distributional ecology. On the North American Pacific coast this species occurs from southeastern Alaska, through British Columbia, Washington and Oregon, to southern California. It occurs commonly from the extreme LW level to to depths of 25 m, in clumps of *Phyllospadix*, algae, and in organic debris, often on shelly sand bottoms, mainly at cold, high salinity, outer coast locations.

Pleusirus secorrus asiaticus Kudrjashov & Tzvetkova

Pleusirus secorrus asiaticus Kudrjashov & Tzvetkova, 1975: 1314, fig. 2A.—Tzvetkova & Kudryashov, 1985: 1.
Pleusirus secorrus Ishimaru, 1985d: 103.—Ishimaru, 1994: 54.

Taxonomic and distributional commentary. This form was collected from clumps of algae and *Phyllospadix* at stations on South Sakhalin I., in the southern part of the Sea of Okhotsk, and south to Pos'yet Bay in the Sea of Japan. It is also recorded from amongst fronds of *Tichocarpus carinatus*, *Cytoseira* sp., and *Laminaria japonica*. Females with eggs and early juveniles occur in July and August.

The Asiatic form of *P. secorrus* has been synonymized by Ishimaru (loc. cit.) and Barnard & Karaman (loc. cit.). However, taxonomic differences noted in the original description (Kudrjashov & Tzvetkova, loc. cit.) suggest that a different species may be involved. In order to justify recognition of *asiaticus* as a full species, it is recommended that the original material be re-examined, redescribed and fully figured.

Systematic and Biogeographical Analyses

This study treats the systematics and distributional ecology of 29 species of the gammaridean subfamily Parapleustinae that occur along both Asiatic and North American coasts of the North Pacific region. A modified phenetic cluster analysis, and corresponding cladistic analysis, indicated the Parapleustinae to be the most advanced phyletically of the 12 recognized subfamilies within family Pleustidae (Bousfield & Hendrycks, 1994). We conclude here by commenting in greater detail on aspects of the morphology and lifestyle and on biogeographical relationships of its component genera and species.

The seven genera of Parapleustinae appear similar in the overall plesiomorphic form of the body and appendages. Greatest morphological diversity occurs in the numbers and kinds of mandibular blades, in the cutting edges of the incisors and left lacinia, and to lesser extent in the form and armature of the gnathopods. Sexually dimorphic gnathopods occur, uniquely in this subfamily, among the Pleustidae. The taxonomic and phyletic relationships of the seven genera are not readily apparent through general inspection, but may be clarified through numerical analysis of characters and character states of those body features (Fig. 43, page 127). For this purpose, a modification of the UPGMA cluster analysis system of Sneath and Sokal (1973) is utilized. The 20 selected taxonomic characters and corresponding character states are outlined in Table I. The overall degree of evolutionary advancement of the genus is provided by a plesio-apomorphic (P.-A.) index, derived by summing the values for each character state for each species, as explained in previous analyses (e.g. Bousfield and Hendrycks, 1994; Jarrett & Bousfield, 1994).

The phenogram of morphological relationships (Fig. 43) suggests that the seven genera are not very closely similar, at least in the characters considered. Only two generic pairs, the North American endemic *Gnathopleustes-Trachypleustes,* and the broadly temperate-subtropical *Incisocalliope-Commensipleustes* cluster at similarities of 70% or better. The pan-Pacific genera *Micropleustes* and *Parapleustes* cluster at 60-65% with the latter complex. However, the mainly North American genus *Chromopleustes* stands in isolation, with less than 50% similarity to the other generic groupings. The P.-A. index is slightly less than 20 (less than 50% of maximum apomorphy) for all genera except the relatively advanced genus *Incisocalliope* where the value is 30 (75% of maximum). These values may indicate that the members of the Parapleustinae are evolutionary "stable", i. e., they remain "locked in" to exploitation of specialized shoal-water niches (e.g., within *Phyllospadix* communities) of the North Pacific region that either do not exist elsewhere (e.g., in the cold-temperate North Atlantic or antiboreal regions), or else are inaccessible because of past and present physical and physiological barriers to dispersal.

A phenogram of morphological relationships within species of the genus *Incisocalliope* is provided in Figure 44,

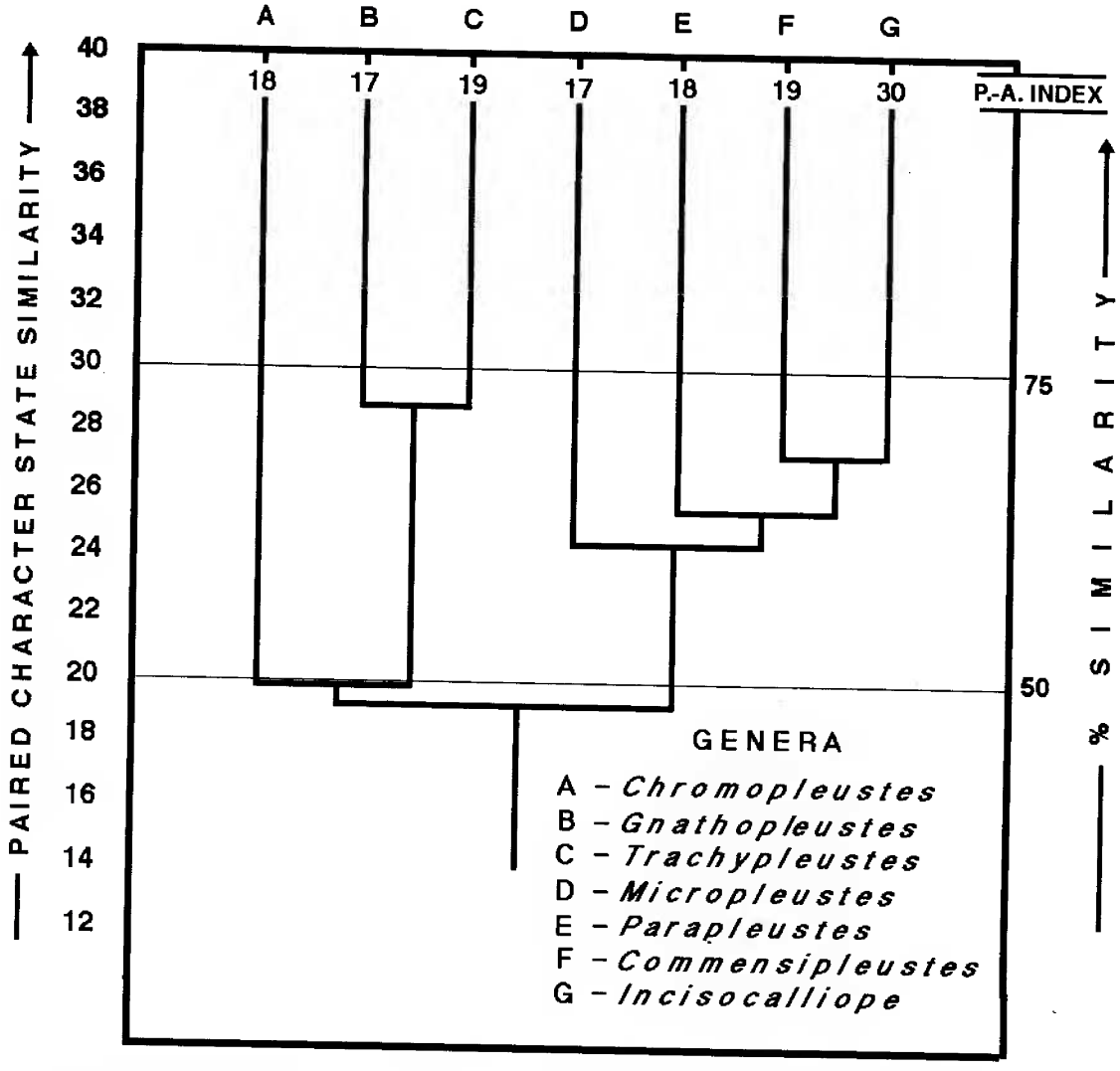

FIG. 43. PHENOGRAM OF GENERA OF SUBFAMILY PARAPLEUSTINAE

p. 129. The analysis is based on 16 characters and corresponding character states orvided in Table II, p. 130. The 8 species cluster into three main assemblages at similarities of 65-75%, viz., a relatively primitive *newportensis-bairdi* group, a very advanced *dilatatus-makiki* group, and a slightly less advanced *derzhavini-aestuarius* group of two closely similar species pairs. These three major assemblages cluster at about the 50% similarity level and appear therefore not closely related. The *newportensis-bairdi* subgroup, known only from inshore waters of southern California, is especially plesiomorphic in character states of the mouthparts and peraeopods, but the gnathopods are powerfully subchelate, and relatively advanced.

Possible biogeographical relationships of the *dilatatus-makiki* group are discussed below (pp. 129-30). The close similarity of the regionally co-occurring sibling species pair of *derzhavini* and *nipponensis* is not unexpected. However, the 90% morphological similarity between the widely separated Asiatic Pacific *filialis*, and the North American Atlantic *aestuarius* is unexpected and defies ready explanation.

Similar analysis of the North American endemic genus *Gnathopleustes* suggests that *G. pugettensis*, *G. simplex*, *G. pachychaetus* and *G. den* form a relatively advanced and closely related species complex that collectively have a continuous distribution from southeastern Alaska to southern California (Table II, p. 129). *Gnathopleustes trichodus* and *G. serratus* are relatively primitive morphologically, isolated phyletically and more restricted distributionally. The *Trachypleustes* species complex, with highly modified mandibular blades, and possibly more speciose than here considered, is more northerly in distribution. At least one species attains the Bering Sea region but has not yet been taken on the Asiatic coast. The *Micropleustes* complex is more speciose on the Asiatic coast. However, the most common North American species of this genus, *M. nautilus*, has the widest range of any parapleustin in the North American Pacific region, from the Bering Sea to southern California. With respect to subfamily Pleusirinae, *Pleusirus secorrus*, including its Asiatic subspecies, is the only known member of family Pleustidae to occur in all nine biogeographic zones of the North Pacific region. Subfamily Dactylopleustinae is

TABLE I. CHARACTERS AND CHARACTER STATES: GENERA OF PARAPLEUSTINAE

CHARACTERS	CHARACTER STATES		
	Plesiomorphic 0	**Intermediate 1**	**Apomorphic 2**
1. Antenna 1, peduncular segment 2: segment 1	long		short
2. Antenna 2, peduncular segments 4 & 5	long		short
3. Upper lip, lobes	shallow subequal		deep, markedly asymmetrical
4. Lower lip, inner lobes	deep narrow		shallow broad
5. Mandibular blades	numerous (>10) long, slender	(7-8) short, acute	few (~5) short, flat
6. Mandible, palp segment 3, number of "D" spines	12-15	8-10	~5
7. Mandibular left lacinia, number of teeth	5-6	7- 9	10+
8. Maxilla 1, outer plate, number of apical spines	9	11	15+
9. Maxilla 1, palp segment 1, number of setae	0	1	2
10. Maxilla 2, width of inner plate	narrow L>W		broad, L=W
11. Maxilliped, inner plate, number facial setae	7-10		0 - 2
12. Maxilliped, segment 3	short		large
13. Gnathopods 1 & 2, size of propod	weak shallow		strong deep
14. Gnathopods 1 & 2, size of carpus	elongate shallow		short deep
15. Gnathopods 1 & 2, degree of sexual dimorphism	none		marked
16. Gnathopods 1 & 2, palmar tooth	strong	vestigial	lacking
17. Coxae 1-3, number of posterior marginal spines	none		3-4
18. Peraeopods 3-7, size of segment 5: segment 4	subequal		5 distinctly shorter
19. Uropods 1 & 2, ramal spines	numerous strong		few weak
20. Telson shape	short broad		elongate narrow

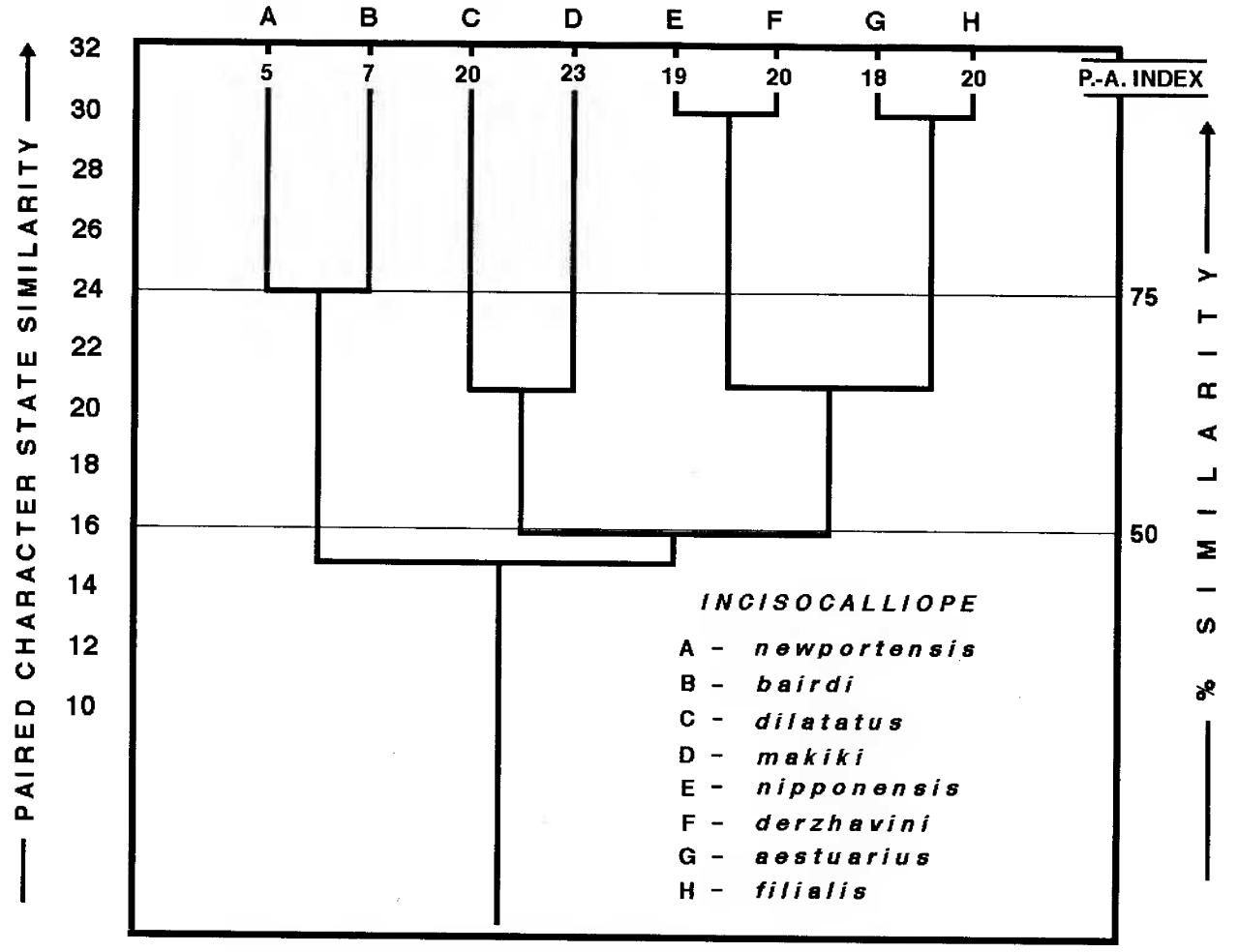

FIG. 44. PHENOGRAM OF SPECIES OF *INCISOCALLIOPE*

represented on Asiatic and North American coasts by the species pair of *Dactylopleustes obsolescens* and *D. echinoides*, respectively. Although these echinoid-commensal species probably have geographical ranges similar to their host species of *Strongylocentrotus*, locality records are yet insufficient for meaningful biogeographical analysis.

Biogeographical considerations

The subfamily Parapleustinae is essentially endemic to continental coasts of the North Pacific region (Table III, p. 131). The distribution of five of the seven genera (i.e. *Chromopleustes, Micropleustes, Gnathopleustes, Trachypleustes* and *Commensipleustes*) is essentaially cold-temperate, whereas *Parapleustes* is subarctic-boreal, and *Incisocalliope* is temperate-subtropical. Of its 28 described species here included, only three species have been recorded elsewhere, viz., *Parapleustes gracilis* from arctic-subarctic, marine parts of the North Atlantic and western Arctic Oceans; *Incisocalliope aestuarius* from temperate estuaries of the western North Atlantic, and *I. makiki* from the Hawaiian Islands in the south-central subtropical North Pacific.

In the northern North Pacific region, 16 species of parapleustins, representative of all seven genera, occur along the coasts of continental North America, whereas only nine species, in four genera, have been recorded to date from the Asiatic continental coast (Table III). In the eastern North Pacific, species numbers are largest along the coast of British Columbia (10 species in each of zones 5, 6) but decrease both northwards and southwards. In the western North Pacific, the fauna of the Asiatic coast is less well known, but most (7) parapleustin species occur in the northern part of the sea of Japan, and fewer (3) in the cold waters of the Sea of Okhotsk to the north. Although no single species has yet been recorded from both continental coasts, the Bering Sea contains five species in four genera, and presumably provides the major pathway of gene flow between the two continental populations.

However, North American species of *Incisocalliope* (i.e. *newportensis* and *bairdi*) are widely separated from their Asiatic counterparts (e.g. *filialis, derzhavini, nipponensis* and *dilatatus*) and are relatively primitive morphologically (Fig. 44, above). These facts would suggest that these populations have been separated geographically for a considerable time, perhaps since the early Palaeogene (50-60 m.y.b.p.) when northern Pacific sea levels were lower, and marine climates were warmer and more equable (Adams,

TABLE II. CHARACTERS AND CHARACTER STATES: *INCISOCALLIOPE* SPECIES

CHARACTER	CHARACTER STATE		
	Plesiomorphic 0	**Intermediate 1**	**Apomorphic 2**
1. Antenna 1, number flagellar segments	30+	~25	<15
2. Antenna 2, number flagellar segments	20+	10-15	~5
3. Mandible, palp seg. 3, number "D" setae	~10		~5
4. Mandible, number of blades in row	10		5
5. Maxilla 1, palp 2, number facial setae	4		0
6. Maxilliped, inner pl., apical "button" spines	4+	3	2
7. Gnathopod1, basis, ant. marginal setation	nearly bare		strong throughout
8. Gnathopod 1, carpal lobe	broad shallow		narrow deep
9. Gnathopod 1, posterior margin, no. setal gps.	3		0
10. Peraeopods 3 & 4, segment5: segment 4	subequal		markedly shorter
11. Peraeopods 5-7, width of basis	broad width~depth		narrow width<< depth
12. Peraeopods 5-7 hind lobe depth	deep, reaching segment 4		shallow
13. Uropod 1, peduncle outer marginal spines	numerous (10+)		few (4) basal position
14. Uropod 2, length of outer ramus: inner	long subequal		markedly shorter
15. Uropod 3, length outer ramus: inner	long (75%+)		short (~60%)
16. Telson, rel. form	long, slender		short, broad

1981). During that period, and perhaps later, early members of the genus may have penetrated via a southern waterway (now blocked by the Panamanian isthmus) to the western Atlantic region where *Incisocalliope aestuarius* remains a sole survivor. The widely disjunct distributions of the *filialis-aestuarius* species pair is also reminiscent of somewhat similar disjunct distributions of the coastal aquatic arachnid order Xiphosurida (Savory, 1964), and the coastal aquatic reptilian genus *Alligator* (Carr, 1963). Both these groups may have been biogeographically continuous between southern Asia and North America during early to middle Cretaceous times, via a Tethyan marine pathway outlined by Howarth (1991). Such a hypothesis is unlikely for parapleustins and related subfamily members of which no relict modern representatives now exist along that route and/or are physiologically unsuited to those marine thermal regimes. The presence in the remote Hawaiian islands of *Incisocalliope makiki*, closely related to *I. dilatatus* of the Asiatic group, is anomalous. However, *I. makiki* may prove to be a relict species, representative of an ancestral group from Japan that penetrated the Hawaiian Archipelago, perhaps during the early Tertiary. They may have survived by "island hopping" as the volcanic islands of the chain successively emerged in the east and eroded away in the west (Howarth & Mull, 1992).

In summary, subfamily Parapleustinae encompasses diverse, relatively advanced morphotypes and specialized lifestyles of pleustid micropredators. These occupy various niches within the *Phyllospadix* and sessile invertebrate communities of intertidal and shallow water habitats, almost exclusively within the North Pacific region. Although this fauna is believed relatively ancient, and probably originated during Mesozoic times (Bousfield, 1982b), the long-term stability of regional shallow-water ecosystems and their marine climates may have been major factors in dampening evolutionary thrust in other directions.

TABLE III . DISTRIBUTION OF GENERA AND SPECIES OF PARAPLEUSTINAE IN THE NORTH PACIFIC REGION.

TAXON	BIOGEOGRAPHIC ZONE								
	1	2	3	4	5	6	7	8	9
1. ***Chromopleustes***									
C. johanseni		X	x						
C. oculatus			X	X	X	x			
C. lineatus				x	X	X	x		
2. ***Micropleustes***									
longimanus	X	x							
behningioides	X								
behningi	X								
nautilus			x	X	X	X	X	X	x
nautiloides						x	X	x?	
3. ***Parapleustes***									
ishimarui		x							
americanus			X	X	X	x			
*gracilis**									
4. ***Gnathopleustes***									
serratus				X	X	X	X	x	
pachychaetus				X	X	X	X		
trichodus					x				
simplex					X				
pugettensis				x	X	X	X	X	?
den								x	X
5. ***Trachypleustes***									
trevori (+ varieties)			x	x	X	X	?		
vancouverensis						x			
6. ***Commensipleustes***									
commensalis								?	X
7. ***Incisocalliope***									
filialis	X								
derzhavini	X								
nipponensis	X								
dilatatis	X								
makiki!									
newportensis									X
bairdi									X
aestuarius+									

* N. Atlantic-subarctic; ! Hawaiian Islands; + N. American Atlantic temperate

BIOGEOGRAPHIC ZONES:

1. Sea of Japan; 2. Sea of Okhotsk; 3. Bering sea and Aleutians; 4. Southeastern Alaska; 5. Northern B. C.; 6. Southern B. C.; 7. Wash.-Oregon; 8. Northern California; 9. Southern & Baja California.

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LEGEND FOR FIGURES

A1	-	antenna 1	MX 1	-	maxilla 1
A2	-	antenna 2	MX2	-	maxilla 2
AC FL	-	accessory flagellum			
BR.	-	coxal gill	MXPD	-	maxilliped
BR PL	-	brood plate	O. P.	-	outer plate
CX	-	coxal plate(s)	P3-P7	-	peraeopods 3-7
DACT	-	dactyl	PLEOS	-	pleosome
DORS	-	dorsal view	PLP	-	palp
EP 1-3	-	pleon plates 1-3	RT	-	right
GN1	-	gnathopod 1	SET	-	seta(e)
GN2	-	gnathopod 2	SP	-	spine
HD	-	head	T	-	telson
I. P.	-	inner plate	U1-U3	-	uropods 1-3
I. R.	-	inner ramus	UROS	-	urosome
LFT	-	left	X	-	magnified
LL	-	lower lip	♂	-	male
MD	-	mandible	♀	-	female